jbr
environmental consultants, inc.

8160 South Highland Drive • Sandy, Utah 84093 • (801) 943-4144 • Fax (801) 942-1852

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December 1, 2000

Mr. Don Ostler, P.E.
Director
Utah Division of Water Quality
288 North 1460 West
P.O. Box 144870
Salt Lake City, Utah 84114-4870

Ms. Pam Grubaugh-Littig
Utah Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
P.O. Box 145801
Salt Lake City, Utah 84414-5801

Subject: Post Closure Fluid Management Plan - North Lily Silver City Facility

Dear Mr. Ostler and Ms. Littig:

The final Post Closure Fluid Management Plan for North Lily's Silver City facility is attached for your review.

Thank you for your cooperation in this matter. Please contact the undersigned with any questions you may have.

Sincerely,

R.J. Bayer

Robert J. Bayer
Vice President

cc: Dennis Frederick, DWQ (w/attachment)
Fred Pehrson, DWQ
Beth Wondimu, DWQ
Mary Ann Wright, Division of Oil Gas and Mining
Wayne Hedburg, Division of Oil Gas and Mining (w/attachment)
Stephen Flechner, North Lily Mining Company (w/attachment)
Mike Keller, VanCott Bagley

NORTH LILY MINING COMPANY
SILVER CITY HEAP LEACH FACILITY
POST-CLOSURE FLUID
MANAGEMENT PLAN

December 1, 2000

Prepared for:

Utah Division of Water Quality
288 North 1460 West
P.O. Box 144870
Salt Lake City, Utah 84114-4870

Prepared by:

JBR Environmental Consultants, Inc.
8160 South Highland Drive
Sandy, Utah 84093
(801) 943-4144

NORTH LILY MINING COMPANY
SILVER CITY HEAP LEACH FACILITY
POST-CLOSURE FLUID MANAGEMENT PLAN

This plan for management of post-closure fluids draining from the heap leach ("heap") at the Silver City Heap Leach Facility ("Facility") has been prepared by JBR Environmental Consultants, Inc. (JBR) at the request of North Lily Mining Company (North Lily). The Facility location is shown on the Location Map, which immediately follows this text.

1.0 INTRODUCTION

1.1 Objective

This plan is intended to describe the proposed design, construction, and operation of a post-closure fluid management for the North Lily Facility. The system would be operated initially with three components: solution storage, using the existing pregnant solution pond and the overflow pond, as necessary; enhanced evaporation using the pregnant solution pond and, if necessary the overflow pond, when weather and temperatures are favorable; and a leachfield for fluid disposal by infiltration. When the pad draindown rate becomes stable and the evaporation system is no longer needed, the leachfield would be used to dispose of all draindown water. Until that as-yet-undetermined time, sufficient evaporation and/or storage capacity to accommodate anticipated draindown fluids without re-application to the heap would be maintained in either the pregnant or overflow pond, or both, as needed.

1.2 Background

This Post-closure Fluid Management Plan (Plan) has been prepared as a follow-up to the Preliminary Draft Plan submitted to the Divisions of Water Quality (DWQ) and Oil Gas and Mining (DOGM) on October 2, 2000. Prior to that time (August 2000) a Conceptual Plan was submitted. That Conceptual Plan provides complete background information not included herein. DWQ has provided comments on the previous two plan submittals. All parties (DWQ, DOGM, and North Lily) have agreed that the leachfield concept is the only viable alternative for fluid disposal at this site. This Plan is intended, with the approval of DWQ and DOGM, to be the final Post-Closure Fluid Management Plan.

2.0 DESIGN CONSIDERATIONS

Preliminary design considerations were listed in the Conceptual Plan. Since preparation of the conceptual plan, percolation tests on the site have been completed and a water quality sample from the pregnant pond inflow has been collected and analyzed, and a contaminant fate and transport analysis had been prepared.

2.1 Percolation Test Results

Five percolation tests (P.T.) were conducted on the site: four to the west and north west of the mill building (P.T.; B, C, D, & E) and one to the south of the heap (P.T.; A). Generalized test pit locations are shown on Sketch 1, Appendix A. The tests were conducted in accordance with testing procedures in UAC R317-5-4. The results of the tests are:

South Test Pit (A)	8.82×10^{-4} cm/sec
West Test Pit (B)	1.85×10^{-3} cm/sec
West Test Pit (C)	4.59×10^{-3} cm/sec
West Test Pit (D)	4.50×10^{-3} cm/sec
West Test Pit (E)	1.76×10^{-4} cm/sec

T.P.'s B, C, and D encountered slightly sandy and clayey, calcareous silt with some gravels found in T.P. D. T.P.'s A and E were excavated in calcareous silty clay.

2.2 Water Quality

Water quality data used for this analysis consists of three samples from the pregnant pond inflow, two collected by DWQ, in 1999 and 2000, and one collected by JBR in August 2000. The results of these analyses are shown in Table 1. Laboratory Reports are provided in Appendix A. Pad draindown water quality was fairly consistent among most of the parameters analyzed over the approximately one-year sampling period. Notable is the consistency among the concentrations of several of the indicator parameters and major ions: TDS, chloride, and sodium. Also notable is the variability among nitrate+nitrite, sulfate and copper. The very high concentration of nitrate+nitrite in the April 2000 sample compared with the other two samples suggests that this analysis may be in error. Of the parameters shown in Table 1, Utah Ground Water Quality Standards have been established for 14 of them. Of those 14, the standards were exceeded in one or more of the samples for 11 parameters: cyanide, fluoride, nitrite, nitrate+nitrite, copper, arsenic, cadmium, mercury, lead, selenium, and silver.

2.3 Fate and Transport Considerations

Based upon JBR's experience in closure and ground water impact assessment projects in Utah and elsewhere, site conditions suggest the potential for success of draindown fluid disposal in a leachfield without an adverse effect on ground water quality. The relatively great depth to ground water and characteristics of the materials that comprise the unsaturated zone are the key factors that favor this disposal alternative. A contaminant fate and transport assessment is presented in Section 4.0, below.

2.4 System Sizing

The two primary factors to be considered in system selection and sizing are the volume and flow rate of water to be handled and the water handling capacity of the system.

2.4.1 Leach Pad Draindown Rate

Although the precise range for the flow rate for post-closure pad draindown cannot yet be determined, an estimate based upon the pad draindown rate that has been measured since solution re-application to the heap was stopped can be made. The flume-measured draindown rate had decreased to less than 15 gpm by September 5 and to less than 10 gpm by September 20. From September 20 to November 20, the draindown rate has been less than 10 gpm and steadily declining until the recent snowmelt caused a slight increase in draindown rate, but still less than 10 gpm. It is reasonable to presume that this draindown rate would not be exceeded after vegetation is established on the heap surface. In the interim, the pad is susceptible to an increased draindown rate resulting from the effects of infiltration of direct precipitation. The increase in draindown rate that may result from these effects cannot be accurately estimated. Nevertheless, several differences will or may contribute to a reduced draindown rate in the upcoming winter season over the last one: the solution inventory has been reduced due to the cessation of fluid application to the pad and the enhanced evaporation program conducted off of the leach pad during the past months; pad regrading scheduled to begin during the week of November 27, will cause sheet wash to exit the pad area rather than being conducted to the pad margin collection trenches and then to the pregnant pond; surface ripping and mulching with composted cow manure will increase the moisture retention capability of the upper approximately one foot of the pad surface. As a result, it reasonable to assume that the pregnant solution pond, possibly with the aid of the overflow pond, will have the capacity to store all fluids not disposed in the leachfield until the spring evaporation season begins.

2.4.2 Leachfield Infiltration Capacity

In accordance with the preceding discussion, the leachfield would be constructed to dispose of 10 gpm of draindown fluid using relatively conservative design assumptions. Although four percolation tests have been conducted in the area, further tests may be necessary to obtain a level of comfort with the consistency of permeability in the area. The available area for leachfield installation in the area of the more permeable soil west and northwest of the mill building is relatively small, perhaps four to five acres; however, the percolation test data indicate that adequate space for construction of the leachfield exists in this area.

3.0 SYSTEM DESIGN

The system design is submitted as a final draft for DWQ review. The design requirements set forth in UAC R317-5 have been followed in preparing the proposed design. The exact location and layout of the leachfield will be adjusted based on further information on percolation rates and fitted to the site topography.

3.1 Design Overview

The flow sheet for the proposed fluid disposal system is shown in Appendix A. The upper flow sheet shows the current fluid flow and lower shows the fluid flow in the proposed system. The latter flow sheet is labeled "interim system." This is because the proposed leachfield and related components have been designed to operate concurrently with the enhanced evaporation system or with the pregnant and overflow ponds in use for fluid storage. Since the pregnant pond will be in place when leachfield operation begins, an in-pond sump, to be located in the northwest corner of the pond is proposed. When the pregnant pond is no longer needed and the draindown rate of the leach pad can be more precisely estimated, the pump system would be eliminated and a distribution box would control the draindown flow. One distribution box would be located at the leachfield and a second distribution box would be located at the leach pad margin and connected to the now buried solution collection pipeline so as to collect all draindown water that flows in the covered channels. This distribution box would be located at a point on the pad margin where the elevation difference between boxes would enable gravity flow to the leachfield at an overall gradient of at least one percent. Until that time, the sump pump will enable the discharge flow rate to be adjusted to meet system capacity.

3.2 Pump and Pipeline

The in-pond sump pump will be located in the northwest corner of the pregnant pond where sediment build-up is minimal and electrical power is easily accessed. The sump pump will pump fluid from the pregnant pond via a polyethylene pipeline to the distribution box for the leach field. The sump pump would be sized to pump the maximum estimated fluid flow and would have an adjustable pump rate. The schematic design for the sump and sump pump shown in Sketch 2 in Appendix A shows the key components: a submersible pump suspended approximately one foot above sump bottom; a polyethylene cylindrical sump with an over-sized bottom plate to enable weighting of the sump in the pond; perforations in the sump wall to allow water to enter; and a motor, discharge line, and controls (float switch and pressure relief valve). The sump pump would operate continuously except when low water level resulted in automatic shut-off by the float valve: A pressure relief valve would divert fluid flow from the discharge line back into the pregnant pond when excess pressure in the distribution box dictates. The unburied section of the discharge pipeline would be insulated or heat-traced to prevent freezing. The buried section of the pipeline would be placed below freeze depth for the entire length. The pipeline would be four-inch HDPE.

3.3 Distribution Boxes

Currently, pre-manufactured septic tanks, which would serve as equalizing basins when the system becomes gravity-fed, are proposed to serve as flow-control distribution and sediment containment boxes at both the pad margin and the inlet to the leachfield. Distribution boxes at both the pad margin and leachfield inlet will provide sediment collection and clean-out points at both ends of the pipeline carrying draindown fluid from the pad margin to the leachfield.

3.4 Leachfield

3.4.1 Leachfield Infiltration Area

The size of the leachfield will be finalized following further test pit excavation and, if necessary, additional percolation tests for the purpose of determining the lateral extent of the more permeable soils found in Test Pits C and D. Table 5, shows the range of general size requirements for the leachfield if it were installed in materials with the average permeability of Test Pits C and D (Zone 1), Test Pit B (Zone 2), Test Pit E (Zone 3). If, as is likely to be the case, the leachfield cannot be installed completely in Zone 1, the infiltration area will be appropriately adjusted to enable a minimum infiltration capacity of 10 gpm. Based on the distribution of the percolation tests, it is probable that the leachfield would be constructed in soils with a mixture of the characteristics of Zones 1 and 2; therefore, per Table 5, the infiltration area would be between 8,800 and 20,000 square feet.

3.4.2 Leachfield Construction Specifications

The leachfield would be constructed in tiers, owing to the slope of the ground surface at the proposed location. Each tier would be constructed so as to be level, with a minimum of two parallel infiltration ditches per tier. Following the guidance in UAC R317-5, the following general specifications will apply: leachfield piping would be four-inch HDPE; perforated laterals would not exceed 100 feet in length; distribution pipes would be solid HDPE; all pipes will be installed level; drop boxes, consisting of a vertically placed HDPE pipe with a solid bottom, would be installed to conduct fluid between levels; these drop boxes would serve as cleanouts; infiltration ditches would be bedded with washed gravel of appropriate size and the pipes would be covered by two inches of gravel; filter fabric would be placed on top of the gravel to prevent fines from entering the gravel blanket during and after backfilling; six inches of loose backfill would be hand-placed prior to machine backfilling and the backfill would not be machine-compacted.

Ditches would be constructed 40 inches wide with wall-to-wall spacing between ditches of 8 feet. The 40 inch width exceeds the maximum 36-inch trench width called for in UAC R317-5; however, the 40-inch trench width accommodates the backhoe bucket available to the chosen construction contractor. The trench spacing has been increased from the 7.5-foot requirement in UAC R317-5 for 36-inch-wide trenches to 8 feet to accommodate the slightly wider trench.

The leachfield would be sited based on surveyed local topography and percolation rate data. The distribution box location and trenches for distribution pipes will be staked on center. Locations of trenches for perforated laterals would be set during construction to ensure that the 8-foot inter-trench distance can be maintained. The DWQ will be consulted after surveying and staking is complete, but before construction begins to obtain approval for the final system size and layout.

4.0 CONTAMINANT FATE AND TRANSPORT ASSESSMENT

The Silver City Facility is located in the Tintic Valley immediately adjacent to the Sevier Desert that lies to the southwest. Together the Sevier Desert and the much smaller Tintic Valley comprise a closed basin (the Sevier Desert Basin) thousands of square miles in area. The Tintic Valley is hydraulically connected to the Sevier Desert both through surface and ground water flow. Tanner Creek, whose intermittent headwaters form approximately five miles to the south-southwest of the project area, carries surface water flow from the Tintic Valley in a southerly direction to the Sevier Desert. Ground water flows in the same direction and enters the Sevier Desert at Tanner Creek Narrows, approximately 17 miles south-southwest of the project site (Mower and Feltis, 1968).

As discussed previously, analyses of heap leach pad draindown fluids over the last year to eighteen months revealed concentrations in excess of Utah Ground Water Quality Standards for 11 parameters, as well as elevated concentrations of chloride, sodium, sulfate, and TDS. Site conditions at the Silver City facility, namely depth to ground water and unconsolidated sediment (soil) characteristics, are highly favorable for disposal of residual, heap leach draindown fluids via a leachfield.

4.1 Background and Data Sources

Fluids that leave the leachfield and reach the underlying water table aquifer through recharge have the potential to affect aquifer water quality. Factors that have mitigative effects on such potential impacts include attenuation in both the unsaturated zone and the aquifer and advection, diffusion, and mixing. In order to assess the influence of these factors, the following data were gathered and compiled: depth to ground water (and unsaturated zone thickness) and lithologic information, such as was available, for the materials in the unsaturated zone from drillers' or geologic logs for 10 water wells or test borings in the general project vicinity; background water quality from the site water supply and monitor well, the former compliance point under the previous ground water discharge permit; aquifer characteristic and recharge data for the Sevier Desert basin (Mower and Feltis, 1968); and water quality data for draindown fluid from analyses performed by state-certified laboratories on behalf of JBR and DWQ.

4.2 Assessment Methods

In the absence of sufficient aquifer data for computer modeling, assessment of the impacts to aquifer water quality by the leachfield effluent in consideration of the effects of advection, diffusion and mechanical mixing has been done by application of a simplistic mixing model. The intent of this model was to conservatively estimate the concentrations of contaminants in the aquifer in the vicinity of the former downgradient monitor well (MW-1) as the result of leachfield operation. This was done by calculating the concentration of contaminants in a volume of water equal to the estimated annual recharge that would influence water quality at MW-1 after receiving the entire volume of leachfield effluent with no reduction in contaminant concentrations. Background concentrations of dissolved constituents in the recharge water were assumed to be the average of those reported in MW-1 water quality analyses. Calculating the resultant concentrations of contaminant ions after mixing the locally derived annual aquifer recharge volume with the entire volume of annual leachfield effluent discharge (at 10 gpm) is a simplistic, but conservative means of assessing the effects of advection, dispersion, and mechanical mixing in the aquifer itself.

The advection/dispersion/dispersion/mixing assessment was conducted by first compiling the following information: a small immediate recharge area, defined as the small immediate watershed area (SIWS, as shown on the Location Map) in which the proposed leachfield is located, was identified and its area measured; a second larger watershed area adjacent to the SIWS on the north, the Mammoth Gulch watershed (MGWS), was also measured; the combined watershed areas were assumed to be the area of recharge influencing water quality at MW-1; average annual rainfall data for two nearby locations, Little Sahara Sand Dunes and Eureka were compiled (Western Regional Climate Center, 2000); and, annual recharge rates were obtained from Mower and Feltis, (1968) for the recharge area of the Sevier Desert basin.

The mass-balance, mixing evaluation itself was conducted in the following manner:

- ⇒ annual draindown fluid volume to the leachfield was multiplied by the average concentrations of the individual dissolved constituents (from three water quality analyses of 1999 and 2000 samples) to obtain the mass of each contaminant released annually from the leachfield;
- ⇒ estimation of the background concentration of each contaminant, determined using water quality data from the compliance well, MW-1;
- ⇒ annual recharge volume for the recharge area less the pad area multiplied by the background concentration of each contaminant to estimate the mass of each contaminant contributed to the aquifer each year by natural recharge;

⇒ dividing the sum of the two mass concentration values for each contaminant by the sum of draindown fluid volume released to the leachfield and the recharge volume to obtain the estimated concentration of each contaminant in the annual recharge contributed to the water table aquifer in the Tintic Valley as the result of the combined contribution of normal aquifer recharge and the discharge from the leachfield.

This part of the assessment was conducted under two scenarios: using only the recharge from the SIWS and using the combined recharge from both the SIWS and MGWS.

Geochemical behavior of contaminants in the unsaturated zone has been estimated and/or predicted using the available lithologic information and commonly accepted principles that control and affect attenuation of dissolved constituents in soils and other geologic materials. Sufficient data does not exist to provide a quantitative assessment of the effects of attenuation on effluent chemistry; however, attenuation has been evaluated from a qualitative standpoint

4.3 Assessment Results

4.3.1 Depth to Ground Water and Geologic Characteristics of the Unsaturated Zone

Drillers' or geologic logs were obtained from the files of the Utah Division of Water Resources over its Internet website and from the files of the DWQ. Copies of these logs are provided in Appendix B. These wells range in distance from the Facility from approximately 0.5 to 4.0 miles. Information on the relative clay content logged in each well or boring and the depth to ground water reported on each log has been compiled and is presented in Table 2. Depth to ground water in the 10 wells ranges from 8 to 440 feet. The depth to the water table was 440 and 330 feet in the two wells closest to the Facility. Based upon limited data on the well logs and the work of Mower and Feltis, (1968), the aquifer in the project vicinity is believed to be unconfined.

The Statement of Basis for Permit No. UT-UGW230001 described the ground water depth in the site vicinity to be 474 feet or greater. The disparities in water depth between that reported on the well logs (Appendix B) and the Statement of Basis can be attributed to fluctuations of water level overtime, since water depths were measured at different times. Lake bed and alluvial deposits were reported to be 325 feet thick in a test hole drilled at the southwest corner of the leach pad, again according to the Statement of Basis. These sediments were described as sand, silt, gravel, and clay with "several beds of clay in the test hole ... 25 to 30 feet thick." Although efforts were made to obtain the log of this well, no log has been located. The unconsolidated material in the closest wells to the Facility, 27-A, 27B, 26-A, and MW-1 (Table 2), have relatively low clay contents. Nevertheless, the statements regarding the presence of clay in the borehole adjacent to the pad in the Statement of Basis has been presumed to be correct for the purposes of this assessment.

4.3.2 Effects of Mixing Draindown Fluid with Natural Waters during Recharge

The average concentration of the various dissolved constituents from water quality samples from three water wells in the project vicinity (Table 3) was assumed to represent the water quality of the volume of water derived annually from the recharge area expected to affect water quality in MW-1. Six scenarios for precipitation and recharge area were selected. They were created using three precipitation data alternatives: Eureka, Little Sahara, and the average for Eureka and Little Sahara. For each precipitation value, two separate annual recharge volumes were calculated, one for the SIWS alone and one for the combined SIWS and MGWS recharge areas. Table 4, Results of Mass-Balance/Mixing Modeling shows the average background and leach pad draindown water quality, the recharge volume for each of the six recharge scenarios, and the predicted concentration of each parameter for each scenario. Appendix C contains a two-page table entitled "Inputs and Results of Mass-Balance/Mixing Modeling" which summarizes the derivation of the modeling results. Concentration results for the Little Sahara precipitation value are shown for each recharge scenario because they are needed to calculate the average precipitation scenario. The Little Sahara station is considered to provide an unrealistic recharge scenario; it is included in the table only for comparative purposes.

The data in Table 4 shows that the estimated concentrations of most contaminants are below Utah Ground Water Quality Standards. Of the 11 parameters for which exceedences of standards have been noted in the draindown fluid, the number of aquifer water quality exceedences predicted for each of the four relevant recharge scenarios ranges from 7 of 11 parameters (SIWS recharge volume from the average of Little Sahara and Eureka precipitation) to 2 of 11 parameters (combined SIWS and MGWS recharge and Eureka precipitation). The combined SIWS and MGWS recharge volumes based on the average precipitation depth is considered the most realistic recharge – precipitation scenario. In this case, the predicted concentrations of arsenic, lead, and WAD cyanide would exceed the Utah Ground Water Quality Standards; however, the predicted concentrations of WAD cyanide and lead, 0.26 mg/l and 0.02 mg/l are only slightly above the standards. In addition, the estimated lead concentration is essentially equal to the background value. When the effects of attenuation in the unsaturated zone, discussed in the next section, are considered, it is very unlikely that water quality impacts resulting from leachfield operation will be measurable in MW-1.

4.3.3 Contaminant Attenuation in the Unsaturated Zone

As stated previously, of the fourteen dissolved components of the draindown fluid for which Utah Ground Water Quality Standards have been established, eleven of these standards have been exceeded in one or more of the three samples of the draindown fluid collected since 1999 (Table 1). These parameters are cyanide, fluoride, nitrite, nitrate+nitrite, copper, cadmium, arsenic, mercury, lead, selenium, and silver.

Attenuation of contaminants in waters infiltrating unsaturated media is controlled by a number of geochemical mechanisms including the following: chemical precipitation as the result of changes in solution equilibria, co-precipitation of trace elements with amorphous iron or manganese oxides, adsorption onto iron and manganese oxide surface coatings, and adsorption onto charged clay particle surfaces. Formation of ionic complexes in solution would often be an intermediate step preceding attenuation. Major ions analyzed in the leach pad draindown fluid are chloride, sulfate, and sodium. Iron, although not analyzed, is probably also present in high concentrations as evidenced by the high dissolved sulfate content in the draindown fluid and the reported refractory (sulfidic) nature of much of the ore placed on the pad. These ions are present in high concentrations because the leach pad fluids and the leach pad material itself have been somewhat in a state of chemical equilibrium. As the draindown fluids are passed through the leachfield and infiltrate into the underlying sediments, equilibrium conditions will change, the fluid will be over-saturated with respect to these ions and precipitation of various mineral salts would be expected to occur in the interstices of the sediments. The reduction in concentrations of these major ions cannot be estimated quantitatively with the available data; however, a significant reduction in these concentrations would predictably occur.

Most of the ions with concentrations in excess of Utah Ground Water Quality Standards are present in minor or trace concentrations. Co-precipitation with iron oxides as particle coatings is well known as a major controlling factor in removal of arsenic, cadmium, copper, and lead from solution. Iron oxide coatings tend to form as particle coatings and when clay and colloidal-sized particles are abundant, the potential surface area per unit volume (surface to volume ratio) for formation of iron oxide coatings in the receiving medium is maximized. Given the clayey and silty nature of the receiving medium (unsaturated zone sediments) at North Lily, this attenuation mechanism is anticipated to be highly effective. In fact surface areas of from 200 to 300 m^2/g in sediments have been estimated (Horowitz, 1985). These iron and manganese oxide coatings are highly charged (Strum and Morgan, 1981); therefore adsorption onto the charged surfaces of iron and manganese oxides is not only a highly effective means of attenuation of metals (Elder, 1988, Jenne, 1968), but almost certain to occur (Elder, 1988). The most favorable conditions for formation of iron and manganese oxide coatings are oxidizing, alkaline conditions like those anticipated in the proposed receiving medium at the Facility.

Silver would be anticipated to attenuate not only through precipitation onto charge iron oxide surfaces, but also by way of direct precipitation of silver chloride compounds. In alkaline, non-reducing conditions, dissolved silver is likely to occur as ionic complexes such as $AgCl_2^-$ or Na $(AgCl_2)^0$ (Brookins, 1988 and Rose, Hawkes, and Webb, 1979). The elevated chloride concentration in the draindown fluid will tend to result in precipitation of silver chloride salts as the solutions re-equilibrate with the materials in the receiving medium (Hem, 1985).

Mercury attenuation is known to occur by way of sorption onto charge manganese and iron oxide surfaces (Elder, 1988), through volatilization and retention in air-filled pore space or, given the high chloride content and alkalinity of the draindown fluid, through precipitation at mercury-chloride salts (Hem, 1985).

Reduction of oxidized forms of selenium (such as selenate or selenite) to more reduced forms such as native selenium or selenide is the only known natural chemical process that provides for significant selenium attenuation in the environment. Although reduction of selenite occurs relatively readily, the free energy required to reduce selenate is difficult to achieve in all but the most intensely reducing environments (Herring, 1990). Selenium species present in the Facility draindown fluid are likely to be selenate or selenite. Chemically reducing conditions are not likely to exist in the subsurface beneath the leachfield; therefore, attenuation mechanisms cannot be counted on to reduce selenium concentrations in infiltrating draindown fluid beneath the proposed leachfield.

Both fluoride and calcium concentrations in the draindown fluid are elevated above local background conditions (see section 4.3.3, below for summary of background water quality from area water wells). Fluoride concentration in natural waters is controlled by the solubility of the mineral fluorite (CaF_2) and ion exchange with some clay minerals. In general, elevated fluoride concentrations would be expected in waters with low calcium concentration (Hem, 1985). The relatively high concentrations of both fluoride and calcium in the draindown fluid indicate that other dissolved ions are probably affecting fluorite solubility. Changes in solution chemistry during recharge may result in reduction of fluoride concentration through precipitation of fluorite; however, the level analysis performed in this assessment cannot support such a conclusion.

Attenuation of WAD (weak acid dissociable) cyanide in soils can occur as a result of adsorption, volatilization, precipitation of cyanide complexes, or a combination of these mechanisms. The presence of clay in the receiving medium is expected to provide for significant attenuation of WAD cyanide; however, a quantitative estimate of the effect of attenuation on cyanide cannot be made with the available data.

Nitrate and nitrite attenuation in the unsaturated zone is also anticipated to be effective in reducing the concentration of these ions. Results of attenuation studies performed in anticipation of draindown fluid disposal in a leachfield at the former USMX Goldstrike Mine in Washington County, Utah provide some useful information in assessing the potential for nitrate attenuation at the Facility. At Goldstrike, a leachfield was designed to be installed on the surface of a waste-rock-filled open pit; fill thickness was estimated at 150-feet and consisted of a mixture of limestone, shale, volcanic rock and clay. The results of the attenuation study showed that the waste rock fill had sufficient attenuative capacity over a 20-year period to reduce concentrations of nitrate from draindown from two heaps with nitrate concentrations of 79 and 188 mg/l to less than 10 mg/l. The waste rock types in the Goldstrike backfill are likely to have similar overall mineralogies to the sediments in the proposed receiving medium at the Facility (see Appendix

B). (Note also that JBR has performed work at both properties, is familiar with site conditions at each locality as well as with the local and regional geology; therefore, JBR is confident in making the preceding statement.) Nitrate + nitrite concentrations in the Facility draindown fluid were reported to be 145 mg/l in the August 2000 sample collected by JBR. The thickness of the unsaturated zone at the Facility is twice that of the Goldstrike fill and undoubtedly has a lower permeability (native, undisturbed soil/sediment versus end-dumped, coarse backfill). Accordingly, it is reasonable to anticipate that attenuation of nitrate in the unsaturated zone at the Facility will be effective in reducing nitrate concentrations in the infiltrating draindown fluid.

4.3.4 Conclusion

The foregoing discussion of the qualitative effects of attenuation combined with the effects of advection, diffusion, and mechanical mixing in the aquifer described in section 4.3.2 demonstrate that operation of the proposed leachfield will result in a *de minimus* impact on water quality.

5.0 REFERENCES

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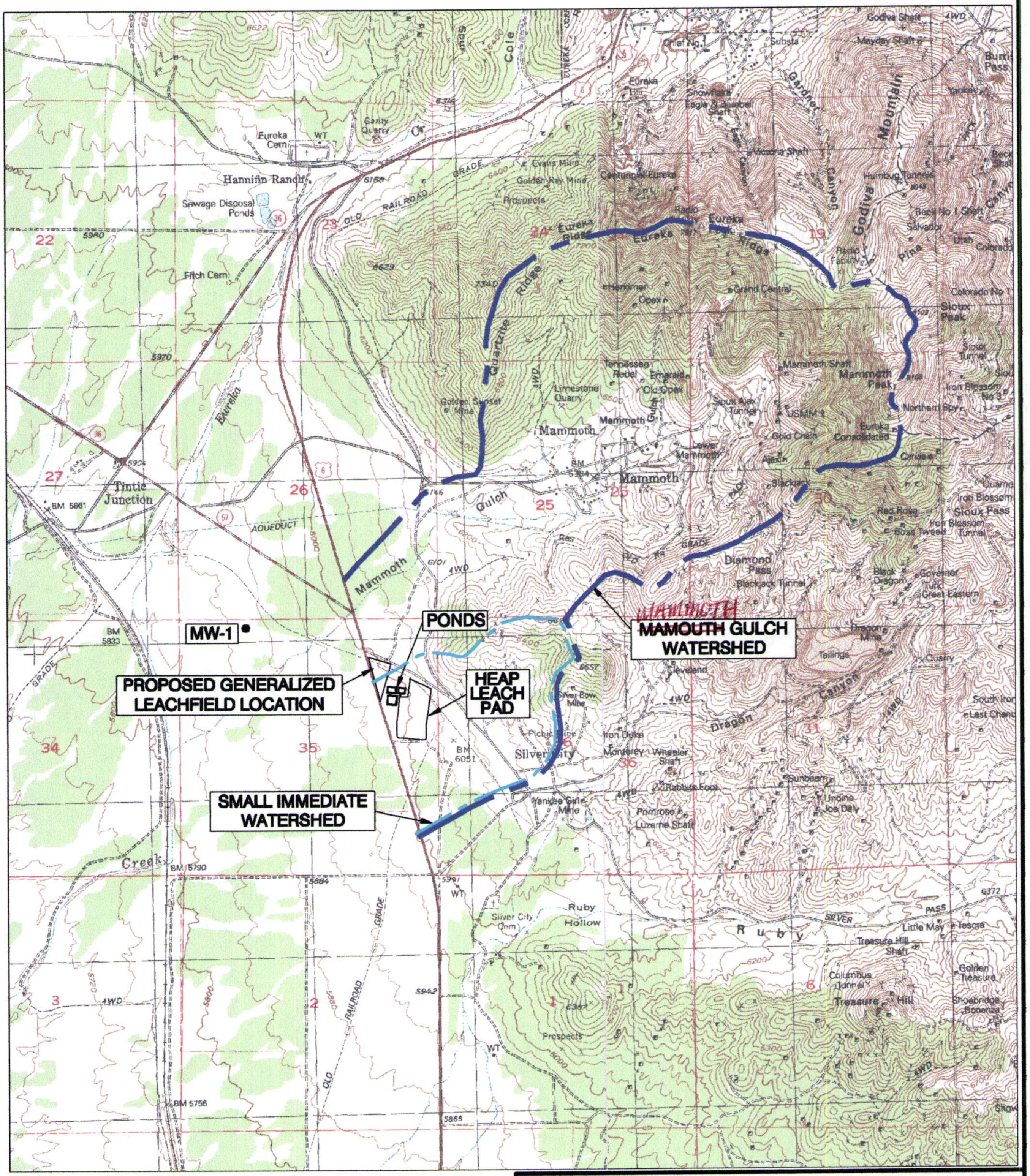
Western Regional Climate Center, 2000. *www.wrec.dri.edu/summary/climsmut.html.* Desert

FIGURE 1
Location Map

R3W R2W

T 10 S

T 11 S



N

3000 0 3000 FEET

NORTH LILLY MINING COMPANY

SILVER CITY LEACH FACILITY

LOCATION MAP 1

~~MAMOUTH~~ MAMMOTH GULCH WATERSHED

jbr environmental consultants, inc.

Salt Lake City, Utah Cedar City, Utah Reno, Nevada Elko, Nevada

DESIGN BY JS	DRAWN BY CP	CH'D BY	SCALE 1"=3000'	DATE DRAWN 11/22/00
				REVISION

North Lilly\NLILLY1-1.DWG

Table 1. Water Quality Summary - Leach Pad Draindown Fluid

North Lily Mining Company Silver City Facility

Date / Sampled by	??-99 DWQ	Apr-00 DWQ	Aug-00 JBR	Utah Ground Water Quality Standard
Parameter				
PH	9.1	8.7	8.1	6.5 - 8.5
Conductance (umhos/cm)	23,000	22,000	23,300	NS
TDS (mg/l)	19,510	18,358	20,000	NS
Alkalinity as Bicarbonate (mg/l)	364	248	388	NS
Total Hardness (mg/l)	1,409.8	1,296.4	NA	NS
Chloride (mg/l)	2,125	2,025	2,220	NS
Cyanide, Amenable to Cl_2 (mg/l)	20.865	34.87	18.80	NS
Cyanide, Total (mg/l)	20.9	35	19	NS
Cyanide, WAD (mg/l)	NA	NA	14.400	0.2 (free)
Fluoride	NA	NA	6.700	4.0
Nitrite, Nitrogen mg/l)	NA	NA	51.000	1.0
Nitrate + Nitrite Total (mg/l)	124	2,110	145	10.0
Sulfate (mg/l)	11,000	4,560	10,200	NS
Barium (mg/l)	0.015	ND	0.010	2.0
Calcium (mg/l)	539	481	350	NS
Chromium (mg/l)	0.009	ND	ND	0.1
Copper (mg/l)	5.70	0.332	19.000	1.3
Magnesium (mg/l)	15.8	0.234	29.000	NS
Manganese (mg/l)	0.130	0.110	NA	NS
Potassium (mg/l)	297	293	310	NS
Sodium (mg/l)	5,570	5,500	5,600	NS
Zinc (mg/l)	0.091	ND	0.420	5.0
Arsenic (mg/l)	0.900	0.076	0.246	0.05
Cadmium (mg/l)	ND	ND	0.008	0.005
Mercury (mg/l)	NA	0.089	ND	0.002
Lead (mg/l)	0.076	0.009	0.158	0.015
Selenium (mg/l)	0.200	0.014	0.271	0.05
Silver (mg/l)	0.370	0.029	0.315	0.10

NA = "Not Analyzed"
ND = "Not Detected"
NS = "No Standard"

Table 2

Well Log Info: % of Materials in the Different Wells										
Location of Well	NE Cor. Sec. 21	NE Cor. Sec. 21	No. 1/4 of Sec. 13	No. 1/4 of Sec. 13	S. 1/4 of Sec. 13	S. 1/4 of Sec. 13	SE 1/4 of Sec 27	SE 1/4 of Sec 27	SE 1/4 of Sec 26	NW 1/4 of Sec 35
Well Number	**21-A**	**21-B**	**13-A**	**13-B**	**13-C**	**13-D**	**27-A**	**27-B**	**26-A**	**MW-1**
Distance from Project Site to Well Location	**SW 4.0 Miles**	**SW 4.0 Miles**	**SSE 2.5 Miles**	**SSE 2.5 Miles**	**SSE 3.0 Miles**	**SSE 3.0 Miles**	**NW 1.6 Miles**	**NW 1.6 Miles**	**NNW 0.5 Miles**	**WNW 0.75 Miles**
Total Depth	605.00	580.00	627.00	512.00	780.00	630.00	610.00	795.00	595.00	528.00
Depth to Water	8.00	23.00	263.00	131.00	33.00	264.00	281.00	274.00	440.00	330.00
Soil	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Clay	46%	40%	20%	30%	18%	20%	7%	19%	0%	0%
Clay/Sand	1%	38%	0%	0%	0%	0%	0%	0%	0%	6%
Clay/Gravel	17%	9%	69%	57%	56%	69%	0%	5%	0%	0%
Clay/Sand/Gravel	13%	13%	0%	0%	14%	0%	0%	0%	3%	10%
Material w/No Clay	9%	0%	11%	13%	12%	11%	93%	76%	27%	0%
Clay w/ Shale	7%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Silt	%	0%	0%	0%	0%	0%	0%	0%	70%	84%
Total Clay-bearing Material	**90%**	**100%**	**89%**	**87%**	**88%**	**89%**	**7%**	**24%**	**3%**	**16%**
Total Non Clay-bearing Materials	**10%**	**0%**	**11%**	**13%**	**12%**	**11%**	**93%**	**76%**	**97%**	**84%**

All wells are located in T. 11 S., R. 3 W. except Wells 2-C and MW-1 which are in T. 10 S., R. 3 W.

Table 3

Ground Water Monitoring Results in and Around the No. Lily Heap Leach Facility						
Sampler	**Units**	**EMS Company**	**No. Lily Mining**	**ESA Consultants**	**Average**	**Units**
Well Number (Date)		**Well Storage Inlet**	**Well Storage Inlet**	**SCSW**		
Date		**9/9/96**	**??/99**	**11/9/99**		
Alkalinity, as Bicarbonate	mg/L	138	129	133	**133**	mg/L
Alkalinity, as Carbonate	mg/L	1	1	1	**1**	mg/L
Aluminum	mg/L	0	0	0	**0**	mg/L
Arsenic	mg/L	0.005	0.005	0.005	**0.005**	mg/L
Barium	mg/L	0.07	0.054	0.069	**0.064**	mg/L
Cadmium	mg/L	0.005	0.001	0.001	**0.002**	mg/L
Calcium	mg/L	72.8	51.7	52	**58.8**	mg/L
Carbon Dioxide	mg/L	0	0	0	**0**	mg/L
Chloride	mg/L	148	139	136	**141**	mg/L
Chromium	mg/L	0.005	0.005	0.005	**0.005**	mg/L
Conductance	umhos/cm	983	950	652	**862**	umhos/cm
Copper	mg/L	0.01	0.01	0.01	**0.01**	mg/L
Cyanide Total	mg/L	0.002	0.002	0.002	**0.002**	mg/L
Fluoride	mg/L	0.2	0.2	0.2	**0.2**	mg/L
Hydroxide	mg/L	1.0	0	0	**0.3**	mg/L
Iron	mg/L	0.34	0.3	0	**0.21**	mg/L
Lead	mg/L	0.04	0.005	0.005	**0.017**	mg/L
Magnesium	mg/L	37.6	30.3	28	**32.0**	mg/L
Manganese	mg/L	0.01	0.02	0	**0.01**	mg/L
Mercury	mg/L	0.0002	0.0002	0.0002	**0.0002**	mg/L
Nitrite, Nitrogen	mg/L	0.005	0.005	0.005	**0.005**	mg/L
Nitrate+Nitrite-Total	mg/L	1.18	0.86	1.2	**1.08**	mg/L
pH	Units	7	7.6	7.56	**7.39**	Units
Potassium	mg/L	4	3.2	2.9	**3.4**	mg/L
Selenium	mg/L	0.002	0.005	0.002	**0.003**	mg/L
Silver	mg/L	0.005	0.05	0.0006	**0.0185**	mg/L
Sodium	mg/L	61.5	53.8	56	**57.1**	mg/L
Sulfate	mg/L	103	87	89	**93**	mg/L
Total Desolved Solids	mg/L	576	476	532	**528**	mg/L
Total Suspended Solids	mg/L	3	3	0	**2**	mg/L
Zinc	mg/L	0.14	0.04	0.02	**0.07**	mg/L

Table 4

Results of Mass-Balance/ Mixing Modeling										
				Portion of Annual Precipitation to Recharge (after Mower, 1968)						
	Assumed Concentration in Recharge Water (from Table 3)	Average Concentration in Leach Pad Effluent (from Appendix C)	Units	Units	Eureka (0.92')		Little Sahara (0.53')		Average (0.73')	
					MGWS + SWIS	SIWS	MGWS + SWIS	SIWS	MGWS + SWIS	SIWS
	-			Liters	1.89E+09	2.91E+08	1.09E+09	1.68E+08	1.49E+09	2.30E+08
				Concentrations of each Parameter						
Alkalinity, as Bicarbonate	133.00	277.75	mg/L	mg/L	135.54	151.97	137.40	165.93	136.22	157.07
Alkalinity, as Carbonate	1	0	mg/L	mg/L	1.00	1	1.00	1	1.00	1
Aluminum	0.0	0.0	mg/L	mg/L	0.00	0.0	0.00	0.0	0.00	0.0
Arsenic	0.005	19.36	mg/L	mg/L	0.18	1.33	0.36	2.30	0.26	1.68
Barium	0.064	0.056	mg/L	mg/L	0.06	0.068	0.07	0.071	0.06	0.069
Cadmium	0.002	0.0269	mg/L	mg/L	0.00	0.004	0.00	0.005	0.00	0.004
Calcium	55.8	474.0	mg/L	mg/L	60.13	88.2	64.48	112.0	62.14	96.9
Carbon Dioxide	0.0	0.0	mg/L	mg/L	0.00	0.0	0.00	0.0	0.00	0.0
Chloride	141	2220	mg/L	mg/L	161.28	293	181.64	404	170.71	333
Chromium	0.005	0.027	mg/L	mg/L	0.01	0.007	0.01	0.008	0.01	0.007
Copper	0.01	26.31	mg/L	mg/L	0.25	1.81	0.49	3.13	0.36	2.29
Cyanide Total	0.002	32.22	mg/L	mg/L	0.30	2.203	0.59	3.822	0.43	2.794
Cyanide WAD	0	19.6	mg/L	mg/L	0.18	1.34	0.36	2.32	0.26	1.70
Fluoride	0.2	3.0	mg/L	mg/L	0.23	0.41	0.26	0.56	0.24	0.46
Hydroxide	0.3	0.00	mg/L	mg/L	0.30	0.30	0.30	0.30	0.30	0.30
Iron	0.21	0.00	mg/L	mg/L	0.21	0.21	0.21	0.21	0.21	0.21
Lead	0.017	0.158	mg/L	mg/L	0.02	0.028	0.02	0.036	0.02	0.031
Magnesium	32	14.26	mg/L	mg/L	32.13	32.97	32.26	33.69	32.19	33.24
Manganese	0.010	0.107	mg/L	mg/L	0.01	0.017	0.01	0.023	0.01	0.019
Mercury	0.0002	0.0998	mg/L	mg/L	0.001	0.007	0.002	0.012	0.002	0.009
Nitrite, Nitrogen	0.005	13.775	mg/L	mg/L	0.13	0.946	0.26	1.638	0.19	1.199
Nitrate+Nitrite-Total	1.08	595.93	mg/L	mg/L	6.52	41.78	11.99	71.73	9.05	52.73
Potassium	3.40	316.00	mg/L	mg/L	6.29	24.98	9.18	40.86	7.63	30.79
Selenium	0.0030	0.1337	mg/L	mg/L	0.00	0.012	0.01	0.019	0.00	0.015
Silver	0.0185	0.2034	mg/L	mg/L	0.02	0.032	0.02	0.043	0.02	0.036
Sodium	57.1	5845.0	mg/L	mg/L	110.49	456.3	164.09	750.0	135.31	563.7
Sulfate	93.0	8888.0	mg/L	mg/L	174.19	700.0	255.70	1146.7	211.93	863.3
Total Desolved Solids	528	19242	mg/L	mg/L	703.76	1842	880.23	2809	785.48	2196
Zinc	0.070	22.905	mg/L	mg/L	0.28	1.634	0.49	2.785	0.38	2.055

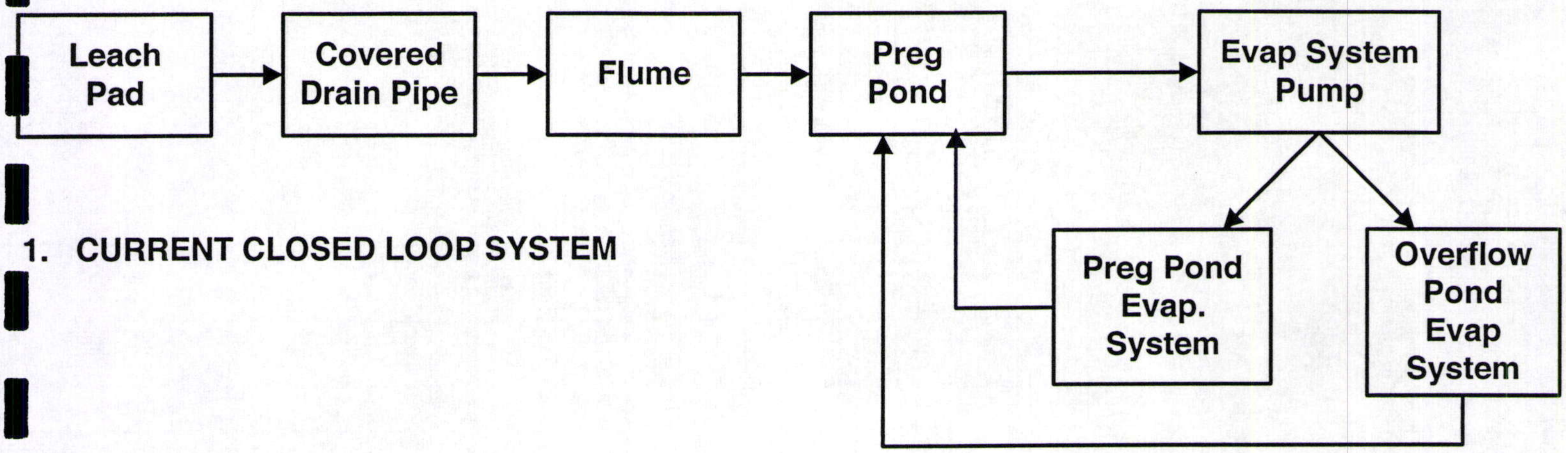
Table 5

Leach Field Design Dimensions			
Zones	**1**	**2**	**3**
Avg. Perc. Rate	4.54E-03	8.82E-04	1.76E-04
Gal./Ft2/Day	1.638	0.720	0.323
10 gpm			
Ft 2	8791.0	20000.0	44582.0
Acres	0.202	0.459	1.024
12 gpm			
Ft 2	10550.0	24000.0	53498.0
Acres	0.242	0.551	1.228

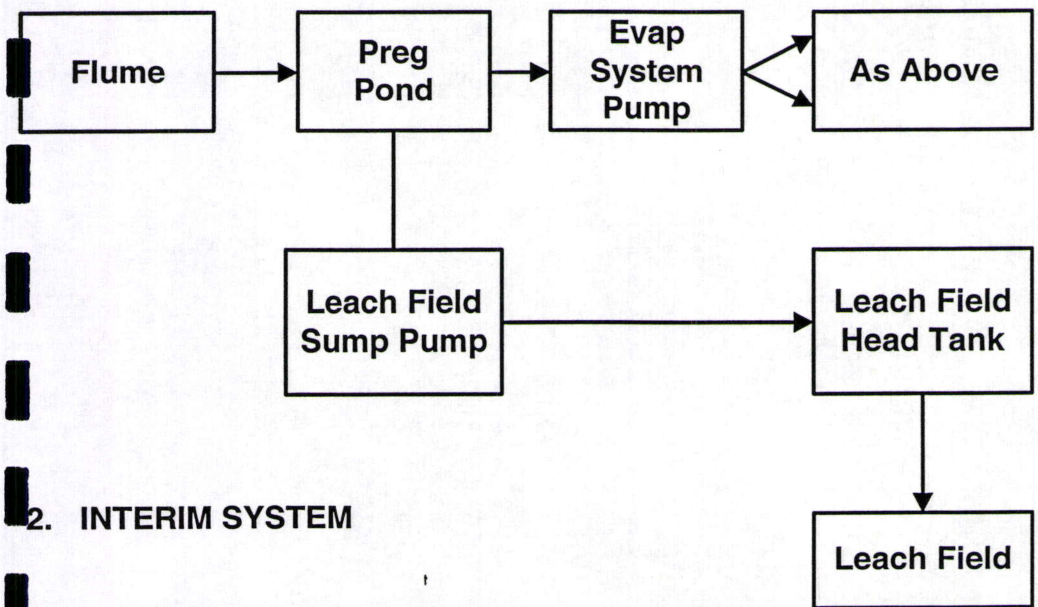
APPENDIX A
Flow Sheets, Sketches, Water Quality Data

POST CLOSURE FLUID MANAGEMENT SYSTEM

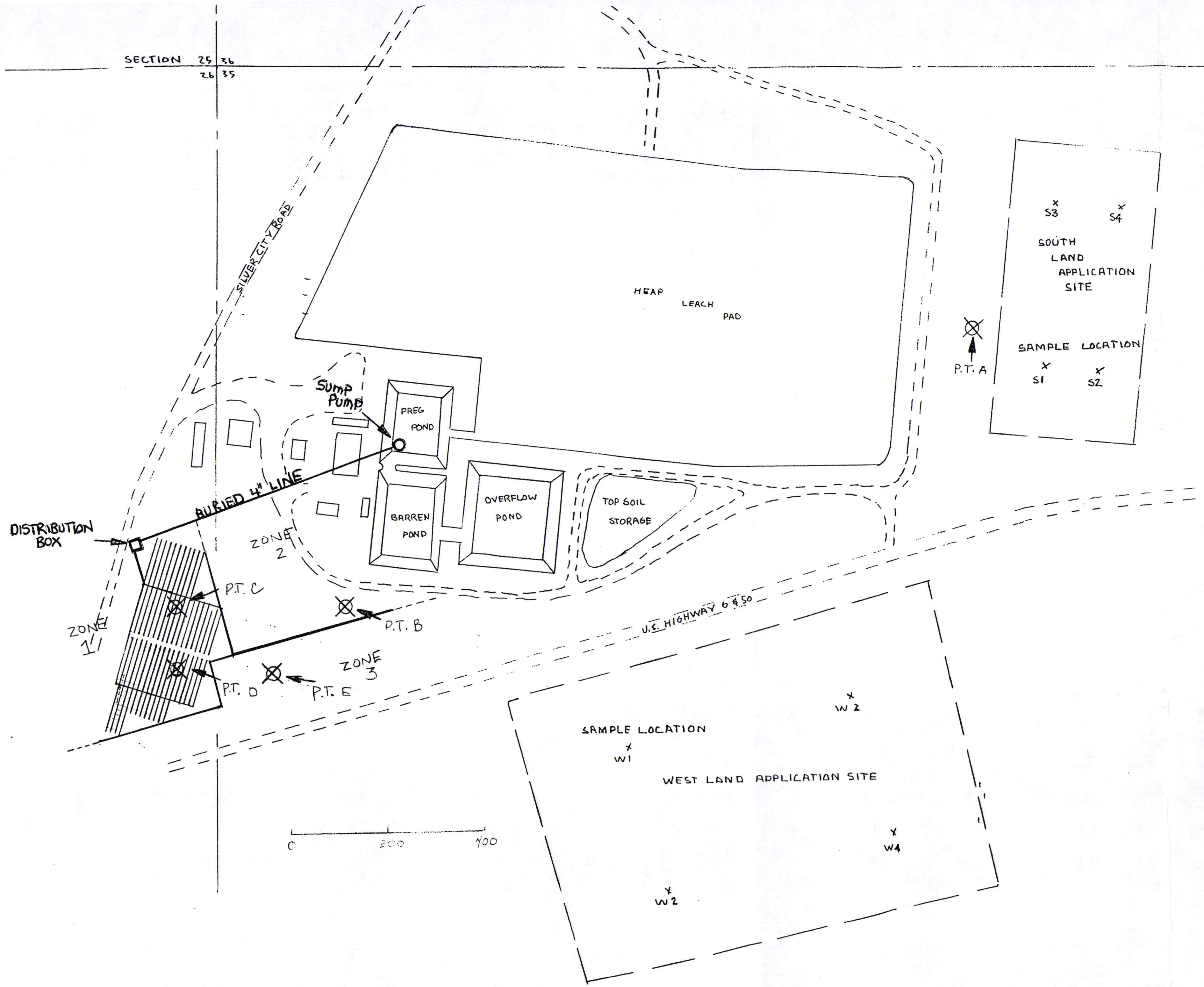
FLOW SHEET



1. CURRENT CLOSED LOOP SYSTEM



2. INTERIM SYSTEM



—POST CLOSURE FLUID MANAGEMENT PLAN—

SKETCH 1

LAND APPLICATION SITE MAP
NORTH LILY MINING COMPANY
SCALE: (APPROXIMATE) 1" = 200'
DATE: MARCH 1997
BY: PAUL SPOR
FIGURE 1

jbr environmental consultants, inc.
Salt Lake City, Utah • Cedar City, Utah • Springville, Utah • Reno, Nevada • Elko, Nevada

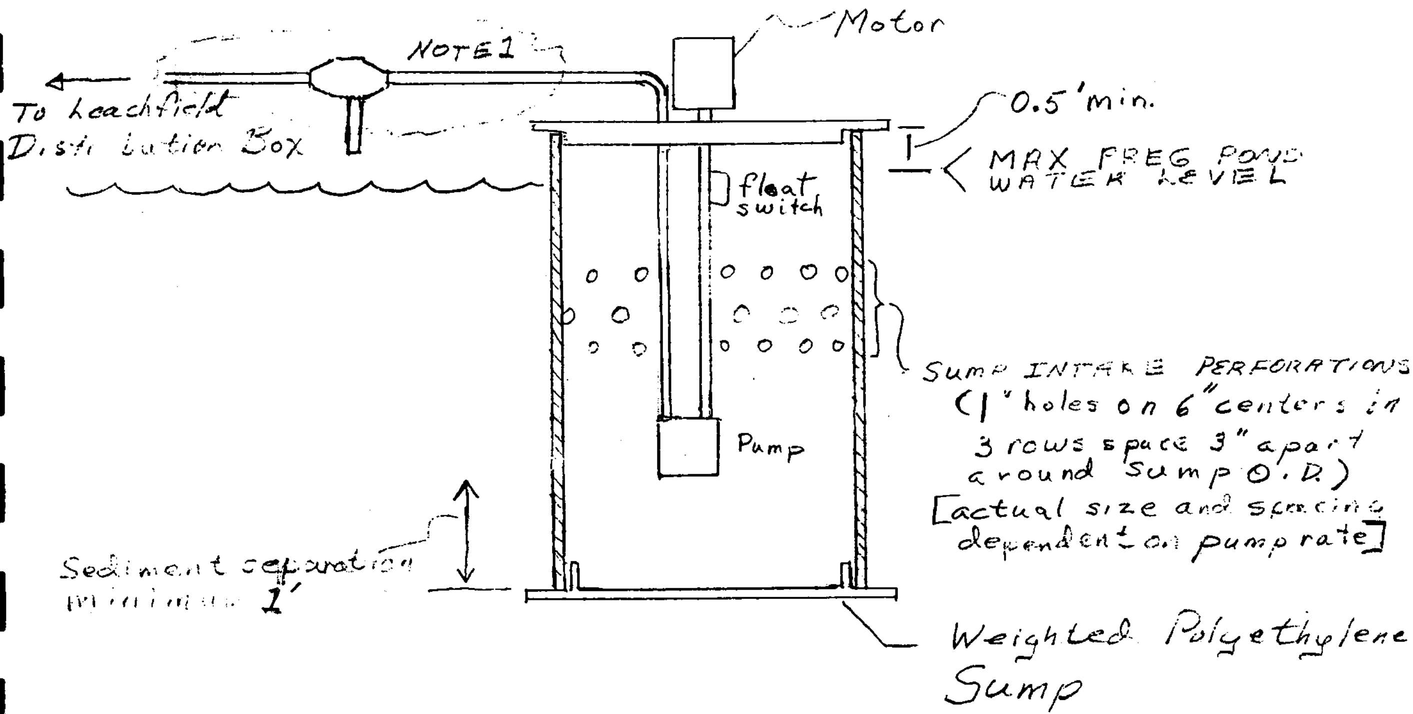
PROJECT NO. N1ly-01
BY RJB DATE 9-25-00
CHK'D BY ______ DATE ______
SHEET NO. ______ OF ______

SKETCH 2

POST CLOSURE FLUID MANAGEMENT SYSTEM

LEACH FIELD SUMP PUMP

LOCATION: NORTHWEST CORNER OF PREG. POND



NOTE 1: Sump pump discharge line to be insulated or heat-traced from sump to point of burial.

1999 #1

FILE COPY

North Lilly flow into pond

Lab Number 199908572 Indicator I

PH	9.1	L-pH		199925717
TSS	<4	T.Sus.Sol	mg/l	199925802
NO2+	124	NO2+NO3, N	mg/l	199925903
CN	20.9	Cyanide	mg/l	199925815
D-AS	900	D-Arsenic	ug/l	199928634
D-BA	15	D-Barium	ug/l	199928637
D-CD	<1	D-Cadmium	ug/l	199928636
D-CA	539	D-Calcium	mg/l	199928604
D-CR	9	D-Chromium	ug/l	199928630
D-CU	5700	D-Copper	ug/l	199928632
D-FE	<220	D-Iron	ug/l	199928701
D-PB	76	D-Lead	ug/l	199928638
D-MG	15.8	D-Magnesum	mg/l	199928602
D-MN	130	D-Mangan	ug/l	199928631
D-K	297	D-Potassum	mg/l	199928603
D-SE	200	D-Selenium	ug/l	199928635
D-AG	370	D-Silver	ug/l	199928639
D-NA	5570	D-Sodium	mg/l	199928601
D-AG	370	D-Silver	ug/l	199928639
D-NA	5570	D-Sodium	mg/l	199928601
D-ZN	91	D-Zinc	ug/l	199928633
BICB	364	Bicarbnate	mg/l	199925717
CO2	0.0000000	Carb. Diox	mg/l	199925717
CARB	0.0000000	Carbonate	mg/l	199925717
CL	2125	Chloride	mg/l	199927211
OH	0.0000000	Hydroxide	mg/l	199925717
SO4	11000	Sulfate	mg/l	199925803
ALK	298	Tot. Alk.	mg/l	199925717
HARD	1409.8	T. Hardns.	mg/l	199925717
TURB	0.54	Turbidity	NTU	199925616
COND	23000	L-Sp. Cond	umhos	199926021
TDS	19510	TDS @ 180C	mg/l	199925816
D-AL	<30	D-Aluminum	ug/l	199928629
CNCL	20.865	Cyan. (Cl)	mg/l	9925815
D-HG	333	D-Mercury	ug/l	199929803
CO3	179	CO3 Solids	mg/l	199925717

2000

UTAH STATE DEPARTMENT OF HEALTH
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

UDEQ - DWQ
ARNE HULTQUIST
288 N 1460 W
PO BOX 144870
SALT LAKE CITY UT 84114-4870 801-538-6146

Lab Number: . 200002437 Sample Type: 04 Cost Code: 352
Description: NORTH LILY FLOW FROM HEAP LEACH INTO POND

Site ID:	599712	Source No:	02
Sample Date:	04/04/00	Time:	10:00
Tot. Cations:	6297 mg/l	272.7 me/l	
Tot. Anions:	6797 mg/l	157.9 me/l	
Grand Total:	13094 mg/l	%D = 26.7	

Organic Review:
Inorganic Review: 07/10/00
Radiochemistry Review:
Microbiology Review:

TEST RESULTS:

L-pH	8.68	T.Sus.Sol	9.0 mg/l
NO2+NO3, N	2110.0 mg/l	Cyanide	35.0 mg/l
D-Arsenic	76.0 ug/l	D-Barium	<5.0 ug/l
D-Cadmium	<1.0 ug/l	D-Calcium	481 mg/l
D-Chromium	<5.0 ug/l	D-Copper	332.0 ug/l
D-Iron	<20.0 ug/l	D-Lead	9.0 ug/l
D-Magnesum	23.4 mg/l	D-Mangan	11.0 ug/l
D-Potassum	293 mg/l	D-Selenium	14.0 ug/l
D-Silver	29.0 ug/l	D-Sodium	5500.0 mg/l
D-Zinc	<30.0 ug/l	Bicarbnate	248 mg/l
Carb. Diox	1 mg/l	Carbonate	0 mg/l
Chloride	2025 mg/l	Hydroxide	0 mg/l
Sulfate	4650.0 mg/l	Tot. Alk.	203 mg/l
T. Hardns.	1296.4 mg/l	Turbidity	0.235 NTU
L-Sp. Cond	22000 umhos	TDS @ 180C	18358 mg/l
D-Aluminum	<30.0 ug/l	Cyan. (Cl)	34.87 mg/l
D-Mercury	89.1 ug/l	CO3 Solids	122 mg/l

QUALIFYING COMMENTS (*) on test results: NO COMMENTS

END OF REPORT

CHEMTECH-FORD ANALYTICAL LABORATO

Date: 9/22/00

To: JBR Consultants
attn. Scott Page
8160 South Highland Drive, Ste. A-4
Sandy, UT 84088

Group #: 39788
Lab #: 00-U007946
Project: SILVER PEAK
Sample Desc: Heap Leach Outfall
Sample Matrix: WASTE WATER
Date/Time Sampled: 8/22/00 , 14:00
Date/Time Received: 8/23/00 , 10:15

CERTIFICATE OF ANALYSIS

PARAMETER	RESULT	MINIMUM REPORTING LIMIT (MRL)	DATE ANALYZED	METHOD	ANALYST
INORGANIC PARAMETERS					
Alkalinity,as Bicarbonate, mg/L	388	1	8/25/00 12:00	SM 2320B	TSM
Alkalinity, as Carbonate, mg/L	< 1	1	8/25/00 12:00	SM 2320B	TSM
Chloride, mg/L	2,220	10	8/30/00 14:00	EPA 325.3	TSM
Conductance, Specific, umhos/cm	23,300	1	8/31/00 10:15	EPA 120.1	MJB
Cyanide, Amenable to Cl2, mg/L	18.8	0.002	9/ 1/00 13:00	ASTM D2036	PNM
Cyanide, Total, mg/L	19	1	9/ 1/00 13:00	ASTM D2036	PNM
Cyanide, WAD, mg/L	14.4	0.457	9/ 8/00 8:00	ASTM D2036	PNM
Fluoride, mg/L	6.7	0.2	9/ 7/00 10:00	EPA 340.2	TSM
Mercury, as Hg (D), mg/L	< 0.0002	0.0002	8/28/00 12:40	EPA 245.2	MJB
Nitrite, Nitrogen. mg/L	51	1.25	8/23/00 12:45	EPA 354.1	TSM
Nitrate+Nitrite-Total, mg/L	145	10	8/31/00 15:00	EPA 353.1	EJB
pH, units	8.1	0.1	8/23/00 12:30	EPA 150.1	LPS
Sulfate, mg/L	10,200	2000	8/29/00 16:00	EPA 375.4	TSM
Total Dissolved Solids, mg/L	20,000	25	8/24/00 12:30	EPA 160.1	LPS
Barium (D), as Ba, mg/L	0.010	0.005	8/29/00 15:19	EPA 200.7	JJT

Approved By: David Gayer
David Gayer, Laboratory Director

MRL = Report detection limit

(generic.rpt)

6100 SOUTH STRATLER
SALT LAKE CITY UTAH 84107 6905
801 262 7299 PHONE
801 262 7378 FAX

Date: 9/22/00

To: JBR Consultants
attn. Scott Page
8160 South Highland Drive, Ste. A-4
Sandy, UT 84088

Group #: 39788
Lab #: 00-U007946
Project: SILVER PEAK
Sample Desc: Heap Leach Outfall
Sample Matrix: WASTE WATER
Date/Time Sampled: 8/22/00 , 14:00
Date/Time Received: 8/23/00 , 10:15

CERTIFICATE OF ANALYSIS

PARAMETER	RESULT	MINIMUM REPORTING LIMIT (MRL)	DATE ANALYZED	METHOD	ANALYST
INORGANIC PARAMETERS					
Calcium (T), as Ca, mg/L	350	0.2	8/29/00 15:19	EPA 200.7	JJT
Chromium (D), as Cr, mg/L	< 0.005	0.005	8/29/00 15:19	EPA 200.7	JJT
Copper (D), as Cu, mg/L	19	0.01	8/29/00 15:19	EPA 200.7	JJT
Magnesium (T), as Mg, mg/L	29	0.2	8/29/00 15:19	EPA 200.7	JJT
Potassium (T), as K, mg/L	310	0.2	8/29/00 15:19	EPA 200.7	JJT
Sodium (T), as Na, mg/L	5,600	20	9/ 5/00 16:25	EPA 200.7	JJT
Zinc (D), as Zn, mg/L	0.42	0.01	8/29/00 15:19	EPA 200.7	JJT
Arsenic (D), as As, mg/L	0.2464	0.0005	9/ 6/00 14:16	EPA 200.8	JJT
Cadmium (D), as Cd, mg/L	0.0076	0.0005	9/ 6/00 14:16	EPA 200.8	JJT
Lead (D), as Pb, mg/L	0.1581	0.0005	9/ 6/00 14:16	EPA 200.8	JJT
Selenium (D), as Se, mg/L	0.2707	0.0005	9/ 6/00 14:16	EPA 200.8	JJT
Silver (D), as Ag, mg/L	0.3147	0.0005	9/ 6/00 14:16	200.2/200.8	JJT
Temperature, Receiving, C	18.0		8/23/00 10:15		CSM

Approved By: David Gayer
David Gayer, Laboratory Director

MRL = Report detection limit

(generic.rpt)

6100 SOUTH STRATLER
SALT LAKE CITY UTAH 84107 6905
801 262 7299 PHONE
801 262 7378 FAX

APPENDIX B
Well Logs

WELLPRT Well Log Information Listing

Version: 2000.10.23.00 Rundate: 11/10/2000 04:47 PM

Utah Division of Water Rights

Water Well Log

LOCATION:

S 1362 ft W 913 ft from NE CORNER of SECTION 21 T 11S R 3W
BASE SL Elevation: feet

OWNER(S):

OWNER: McIntyre, Samuel
ADDRESS: McIntyre Rancy
CITY: Leamington STATE: UT ZIP: 84638
REMARKS: Samuel McIntyre Investment Company

DRILLER ACTIVITIES:

ACTIVITY # 1 NEW WELL
DRILLER: STEPHENSON DRILLING
LICENSE #: 106
START DATE: 07/13/1971 COMPLETION DATE: 08/16/1971

BOREHOLE INFORMATION:

Depth(ft) From	Depth(ft) To	Diameter(in)	Drilling Method	Drilling Fluid
0	605	16	CABLE	

LITHOLOGY:

Depth(ft) From	Depth(ft) To	Lithologic Description / Rock Type	Color
1	15	WATER-BEARING,OTHER SURFACE 15' WATER	SURFACE
15	52	WATER-BEARING,CLAY,SILT,SAND WATER POOR	
52	58	CLAY,SAND,GRAVEL SMALL GRAVEL	GREY
58	68	SILT,SAND	
68	70	CLAY	
70	100	SILT,SAND,GRAVEL	
100	105	CLAY	
105	148	CLAY,SAND,GRAVEL	

			STRATIFIED LAYERS
	148	153	CLAY,GRAVEL
			MIXED
	153	183	CLAY,SAND,GRAVEL
			CLAY SHOWING
	183	215	CLAY
			NO WATER
	215	217	SAND,GRAVEL
	217	219	CLAY
	219	221	SAND,GRAVEL
	221	251	CLAY,GRAVEL
	251	276	CLAY
GREY			
	276	287	CLAY
TAN			
	287	305	CLAY,GRAVEL
LIGHT			
			GRAVEL SHOWING
	305	327	CLAY,GRAVEL
			STRATIFIED LAYERS
	327	396	CLAY
	396	400	GRAVEL
			GOOD
	400	412	CLAY,GRAVEL
			MIXED
	412	446	CLAY
GREY			
	446	450	CLAY,GRAVEL
GREY			
			GRAVEL SHOWING
	450	453	GRAVEL
	453	493	CLAY
	493	495	GRAVEL
	495	507	CLAY,GRAVEL
			THIN LAYERS
	507	565	CLAY
	565	605	CLAY
SHALE			

WATER LEVEL DATA:

Date	Time	Water Level (feet) (-)above ground	Status
08/16/1971		8.00	STATIC

CONSTRUCTION - CASING:

Depth(ft) From	To	Material	Gage(in)	Diameter(in)
1	580		.312	19

CONSTRUCTION - SCREENS/PERFORATIONS:

Depth(ft) Screen(S) or Perforation(P) Slot/Perf. siz Screen
Diam/Length Perf(in) Screen Type/# Perf.

From	To	Screen(S) or Perforation(P)	Slot/Perf. siz	Screen Diam/Length Perf(in)	Screen Type/# Perf.
105	183	PERFORATION	.375	3	MILLS/250
215	327	PERFORATION	.375	3	325

	396	453	PERFORATION	.375	3
200					
	493	580	PERFORATION	.375	3
300					

GENERAL COMMENTS:

*WATER RIGHT NO. 68-644

*WELL did not deliver the 8 sec.-ft. alloted in the application.

21-B

WELLPRT Well Log Information Listing

Version: 2000.10.23.00 Rundate: 11/10/2000 04:52 PM

Utah Division of Water Rights

Water Well Log

LOCATION:

S 1363 ft W 914 ft from NE CORNER of SECTION 21 T 11S R 3W
BASE SL Elevation: feet

DRILLER ACTIVITIES:

ACTIVITY # 1 WELL REPLACEMENT
DRILLER: STEPHENSON DRILLING
LICENSE #: 106
START DATE: 12/05/1973 COMPLETION DATE: 12/20/1973

BOREHOLE INFORMATION:

Depth(ft) From	To	Diameter(in)	Drilling Method	Drilling Fluid
0	580	16	CABLE	

LITHOLOGY:

Depth(ft) From	To	Lithologic Description	Color	Rock Type
0	2	OTHER SURFACE		
2	62	WATER-BEARING,CLAY,SILT,SAND WATER 14 FT.		
62	102	CLAY,GRAVEL GRAVEL SHOWING		
102	195	CLAY,SILT,SAND		
195	222	CLAY,SAND,GRAVEL		
222	235	CLAY,GRAVEL GRAVEL SHOWING		
235	248	CLAY,SAND,GRAVEL		

	248	258	CLAY
RED			
	258	295	CLAY,SAND,GRAVEL
	295	360	WATER-BEARING,CLAY,SILT WATER WEAK
	360	580	CLAY
GREY & BROWN			
			CHANGING COLOR GRAY & BROWN.

WATER LEVEL DATA:

Date	Time	Water Level (feet) (-)above ground	Status
12/15/1973		23.00	STATIC

CONSTRUCTION - CASING:

Depth(ft) From	To	Material	Gage(in)	Diameter(in)
1	534		312	16

CONSTRUCTION - SCREENS/PERFORATIONS:

Depth(ft) From	To	Screen(S) or Perforation(P)	Slot/Perf. siz	Screen Diam/Length Perf(in)	Screen Type/# Perf.
50	360	PERFORATION	.375	4	MILLS/1300

WELL TESTS:

Date	Test Method	Yield (CFS)	Drawdown (ft)	Time Pumped (hrs)
12/15/1973	PUMP	.334		

13-A

WELLPRT Well Log Information Listing

Version: 2000.10.23.00 Rundate: 11/10/2000 04:58 PM

Utah Division of Water Rights

Water Well Log

LOCATION:

S 850 ft W 10 ft from N4 CORNER of SECTION 13 T 11S R 3W
BASE SL Elevation: feet

DRILLER ACTIVITIES:

ACTIVITY # 1 NEW WELL
DRILLER: Robinson Drilling Company
LICENSE #: 10
START DATE: 05/25/1978 COMPLETION DATE: 09/18/1978

BOREHOLE INFORMATION:

Depth(ft) From	Depth(ft) To	Diameter(in)	Drilling Method	Drilling Fluid
0	627	16	CABLE	

LITHOLOGY:

Depth(ft) From	Depth(ft) To	Lithologic Description	Color	Rock Type
0	83	CLAY,COBBLES,BOULDERS		
83	92	CLAY		
92	114	CLAY,GRAVEL,COBBLES		
114	142	CLAY		
142	171	CLAY,GRAVEL,BOULDERS		
171	178	GRAVEL		
178	187	CLAY,GRAVEL		
187	212	GRAVEL		
212	271	CLAY		
271	327	CLAY,GRAVEL,COBBLES		
327	361	WATER-BEARING,GRAVEL,COBBLES,BOULDERS		
361	501	CLAY,GRAVEL,COBBLES		

501	534	CLAY
534	627	WATER-BEARING,CLAY,GRAVEL

WATER LEVEL DATA:

Date	Time	Water Level (feet) (-)above ground	Status
08/22/1978		263.00	STATIC

CONSTRUCTION - CASING:

Depth(ft) From	To	Material	Gage(in)	Diameter(in)
0	623	NEW	.312	16

CONSTRUCTION - SCREENS/PERFORATIONS:

Depth(ft) From	To	Screen(S) or Perforation(P)	Slot/Perf. siz	Screen Diam/Length Perf(in)	Screen Type/# Perf.
285	355	PERFORATION	.375	3	MILLS/325
365	495	PERFORATION	.375	3	565
535	615	PERFORATION	.375	3	325

WELL TESTS:

Date	Test Method	Yield (CFS)	Drawdown (ft)	Time Pumped (hrs)
08/22/1978	PUMP	1.270	347	23

WATER QUALITY DATA AVAILABLE

GENERAL COMMENTS:

*SEAL - Bentonite clay
*PROOF is not due until 1994.

WELLPRT Well Log Information Listing

Version: 2000.10.23.00 Rundate: 11/10/2000 04:59 PM

Utah Division of Water Rights

Water Well Log

LOCATION:

S 500 ft W 10 ft from N4 CORNER of SECTION 13 T 11S R 3W
BASE SL Elevation: feet

DRILLER ACTIVITIES:

ACTIVITY # 1 NEW WELL
DRILLER: Robinson Drilling Company
LICENSE #: 10
START DATE: 03/30/1978 COMPLETION DATE: 05/25/1978

BOREHOLE INFORMATION:

Depth(ft) From	Depth(ft) To	Diameter(in)	Drilling Method	Drilling Fluid
0	515	16	CABLE	

LITHOLOGY:

Depth(ft) From	Depth(ft) To	Lithologic Description	Color	Rock Type
0	12	CLAY		
12	17	CLAY,BOULDERS		
17	83	CLAY,GRAVEL,COBBLES		
83	117	CLAY		
117	157	CLAY,GRAVEL		
157	193	CLAY		
193	200	SAND,GRAVEL		
200	248	CLAY,GRAVEL		
248	251	CLAY		
251	294	CLAY,GRAVEL		
294	309	CLAY		
309	324	CLAY,GRAVEL,BOULDERS		

324	332	CLAY
332	344	CLAY, COBBLES
344	358	CLAY
358	396	CLAY, GRAVEL
396	406	CLAY
406	409	GRAVEL
409	432	CLAY
432	438	SAND, GRAVEL
438	464	CLAY, GRAVEL
464	512	SAND, GRAVEL, COBBLES

WATER LEVEL DATA:

Date	Time	Water Level (feet) (-)above ground	Status
05/02/1978		131.00	STATIC

CONSTRUCTION - CASING:

Depth(ft) From	To	Material	Gage(in)	Diameter(in)
0	512	NEW	.375	16

CONSTRUCTION - SCREENS/PERFORATIONS:

Depth(ft) From	To	Screen(S) or Perforation(P)	Slot/Perf. siz	Screen Diam/Length Perf(in)	Screen Type/# Perf.
315	345	PERFORATION	3	.375	MILLS/170
358	370	PERFORATION	3	.375	MILLS/65
375	385	PERFORATION	3	.375	MILLS/115
405	408	PERFORATION	3	.375	MILLS/20
424	438	PERFORATION	3	.375	MILLS/85
464	508	PERFORATION	3	.375	MILLS/205

WELL TESTS:

Date	Test Method	Yield (CFS)	Drawdown (ft)	Time Pumped (hrs)
05/25/1978	PUMP	2.941	250	20

WATER QUALITY DATA AVAILABLE

GENERAL COMMENTS:

*PROOF not due until 1994

B-C

WELLPRT Well Log Information Listing

Version: 2000.10.23.00 Rundate: 11/11/2000 12:59 PM

Utah Division of Water Rights

Water Well Log

LOCATION:

N 1803 ft W 103 ft from S4 CORNER of SECTION 13 T 11S R 3W
BASE SL Elevation: feet

DRILLER ACTIVITIES:

ACTIVITY # 1 NEW WELL
DRILLER: Robinson Drilling Company
LICENSE #: 10
START DATE: 09/18/1978 COMPLETION DATE: 01/19/1979

BOREHOLE INFORMATION:

Depth(ft) From	To	Diameter(in)	Drilling Method	Drilling Fluid
0	780	16	CABLE	

LITHOLOGY:

Depth(ft) From	To	Lithologic Description Rock Type	Color
0	6	CLAY	
6	71	CLAY,GRAVEL	
71	171	CLAY,COBBLES	
171	178	SILT	
178	270	CLAY	
270	285	WATER-BEARING,CLAY SMALL AMOUNT OF WATER	
285	330	CLAY,GRAVEL	
330	421	WATER-BEARING,CLAY,GRAVEL,COBBLES WATER INCREASING	
421	437	CLAY	
437	505	CLAY,GRAVEL	

505	515	GRAVEL
515	536	CLAY,GRAVEL
536	631	CLAY,SAND,GRAVEL
631	674	CLAY,GRAVEL
674	689	CLAY,SAND,GRAVEL
689	698	CLAY
698	703	SILT
703	746	SAND
746	767	SILT,SAND
767	780	SAND,GRAVEL

WATER LEVEL DATA:

Date	Time	Water Level (feet) (-)above ground	Status
01/18/1979		33.00	STATIC

CONSTRUCTION - CASING:

Depth(ft) From	To	Material	Gage(in)	Diameter(in)
0	780	NEW	.312	16

CONSTRUCTION - SCREENS/PERFORATIONS:

Depth(ft) From	To	Screen(S) or Perforation(P)	Slot/Perf. siz	Screen Diam/Length Perf(in)	Screen Type/# Perf.
330	515	PERFORATION	.625	3	MILLS/615
587	595	PERFORATION	.625	3	MILLS/35
614	620	PERFORATION	.625	3	MILLS/30
632	695	PERFORATION	.625	3	MILLS/250
705	775	PERFORATION	.625	3	MILLS/270

CONSTRUCTION - FILTER PACK/ANNULAR SEALS

Depth(ft) From	To	Material	Amount	Density(pcf)
0	50	BENTONITE CLAY		

WELL TESTS:

Date	Test Method	Yield (CFS)	Drawdown (ft)	Time Pumped (hrs)
01/18/1979	PUMP	3.008	212	27

GENERAL COMMENTS:

*PROOF not due until 1994.

13-D

WELLPRT Well Log Information Listing

Version: 2000.10.23.00 Rundate: 11/11/2000 12:53 PM

Utah Division of Water Rights

Water Well Log

LOCATION:

N 1803 ft W 3 ft from S4 CORNER of SECTION 13 T 11S R 3W
BASE SL Elevation: feet

DRILLER ACTIVITIES:

ACTIVITY # 1 NEW WELL
DRILLER: Robinson Drilling Company
LICENSE #: 10
START DATE: 05/25/1978 COMPLETION DATE: 09/18/1978

BOREHOLE INFORMATION:

Depth(ft) From	Depth(ft) To	Diameter(in)	Drilling Method	Drilling Fluid
0	627	16		

LITHOLOGY:

Depth(ft) From	Depth(ft) To	Lithologic Description / Rock Type	Color
0	83	CLAY,COBBLES,BOULDERS	
		271-327 - WATER	
		327-361 - WATER	
		361-501 - WATER	
		501-534 - WATER	
		534-627 - WATER	
83	92	CLAY	
92	114	CLAY,GRAVEL,COBBLES	
114	142	CLAY	
142	171	CLAY,GRAVEL,BOULDERS	
171	178	GRAVEL	
178	187	CLAY,GRAVEL	

187	212	GRAVEL
212	271	CLAY
271	327	CLAY,GRAVEL,COBBLES
327	361	GRAVEL,COBBLES,BOULDERS
361	501	CLAY,GRAVEL,COBBLES
501	534	CLAY
534	627	CLAY,GRAVEL

WATER LEVEL DATA:

Date	Time	Water Level (feet) (-)above ground	Status
08/22/1978		264.00	STATIC

CONSTRUCTION - CASING:

Depth(ft) From	Depth(ft) To	Material	Gage(in)	Diameter(in)
0	623		16	.312

STEFFEN ROBERTSON & KIRSTEN
Consulting Engineers

CLIENT	DATA SUPPLIED BY PREVIOUS OWNER
PROJECT	TINTIC
PROJECT No.	13701
DATE DRILLED	9/29/80
DRILLER	

WELL No. C-4284

27-1

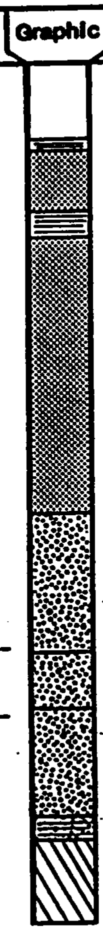
SHEET 1 of 1

INSPECTOR

LOCATION SECTION 27 @ TANKS STATION

COORDINATES

SURFACE ELEVATION

DEPTH (feet)	COMMENTS	Graphic	WELL	CUTTINGS DESCRIPTION
0				YELLOW BROWN CLAY - 3'
				CONGLOMERATE, LIME ROCK, QUARTZ - 46'
				YELLOW CLAY - 20'
100				
				CONGLOMERATE, LIME ROCK, HARD QUARTZ - 212'
200				
300				LOOSE CONGLOMERATE, LIME ROCK WITH GRAVEL, PORPHRY AND FINE SAND - 157'
400	PERFORATION ZONE 390' TO 436'			
				CONGLOMERATE, LIME ROCK, QUARTZ EXTREMELY HARD AND TOUGH, WATER BEARING - 80'
500				CONGLOMERATE, LOOSE ROCK, CLAY - 14'
				CONGLOMERATE, LIME ROCK, QUARTZ, HARD, TOUGH, SOME WATER SEEPAGE - 78'
600				

TOTAL DEPTH 610'
STATIC LEVEL 281'
FLOW RATE 280 GPM
ALL 12" HOLE

27-F

STEFFEN ROBERTSON & KIRSTEN
Consulting Engineers

CLIENT	DATA SUPPLIED BY PREVIOUS OWNER
PROJECT	TINTIC
PROJECT No.	13701
DATE DRILLED	9/29/80
DRILLER	
WELL No.	C-4286
SHEET	1 of 1
INSPECTOR	

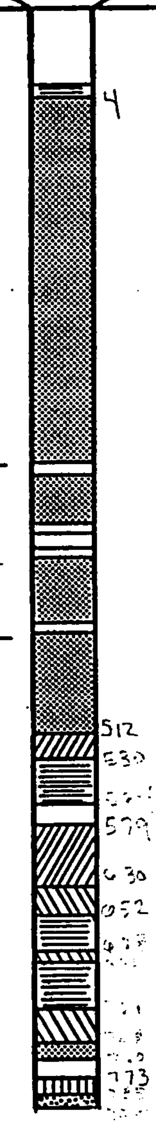
LOCATION SE 1/4 SECTION 27

COORDINATES

SURFACE ELEVATION

DEPTH (feet)	COMMENTS	CUTTINGS DESCRIPTION
0		YELLOW BROWN CLAY - 4'
100		
200		SEDIMENTARY ALLUVIUM - 508' (CONGLOMERATE)
300	PERFORATION ZONE 298' TO 302' 340' TO 346' 359' TO 363' 416' TO 424'	
400		
500		MONZONITE - 18'
		YELLOW CLAY - 34'
		CONGLOMERATE, LIME ROCK - 15'
600		YELLOW CLAY, MONZONITE - 51'
		GRAY LIME ROCK - 22'
		YELLOW CLAY - 26'
		GRAY LIME ROCK - 8'
700		YELLOW CLAY 37'
		GREY LIME ROCK WITH YELLOW CLAY - 27'
		YELLOW CLAY BOULDERS - 12'
		PORPHRY - 13'
		LIME QUARTZITE - 12'
		LOOSE ROCK AND SAND - 10'
800		

Graphic / WELL



TOTAL DEPTH 795'
STATIC LEVEL 274'
FLOW RATE 60 GPM
415' OF 17" HOLE
391' OF 8" HOLE

STEFFEN ROBERTSON & KIRSTEN
Consulting Engineers

CLIENT	Data Supplied by Previous Owner
PROJECT	Tintic
PROJECT No.	13701
DATE DRILLED	1/19/81-1/22/81
DRILLER	
WELL No.	NLE-1
SHEET	1 OF 2
INSPECTOR	

LOCATION SE 1/4, Sec. 26, T. 10S, R.3W

COORDINATES

SURFACE ELEVATION

COMMENTS Air to 255', water to 595'. Water table at 440'. Air lift water 4 gmp at 500', 8 gpm at 520', 11 gpm at 540', 9 gpm at 555', 15 gpm at 575', 9 and 14 gpm at 595'. Ec = 1250 mmhos/cm

FROM	TO	DESCRIPTION
0'	10'	Medium brown soil to 1 foot over coarse sand, silt and pebbles mainly limestone.
10'	20'	Medium brown silt and fine sand containing grey limestone pebbles.
20'	30'	Light tan silt and fine sand containing numerous small pebbles of grey limestone.
30'	50'	Light tan silt to coarse sand with granules and pebbles of grey limestone and some quartzite.
50'	80'	Medium to light brown silt with fine sand, minor amounts of coarse sand and granules, scattered small pebbles.
80'	90'	Medium brown silt and bery fine sand.
90'	100'	Medium to light brown silt with fine sand, minor amounts of coarse sand and granules, scattered pebbles.
100'	110'	Light brown silt containing sand to pebbles of limestone and quartzite.
110'	120'	Medium brown silt and fine sand.
120'	130'	Light brown silt and sand with small pebbles of limestone.
130'	160'	Light brown fine sand containing silt and pebble.
160'	170'	Reddish brown silt containing a few pebbles of limestone.
170'	180'	Light grey silt and sand containing dark grey pebbles of limestone.
180'	190'	Medium brown silt to coarse sand containing small limestone pebbles.
190'	210'	Light brown silt with small amounts of sand and granules.
210'	230'	Light brown silt and sand containing large pebbles and cobbles (?) of grey limestone.
230'	260'	Medium brown sand containing graules and small pebbles of limestone and quartzite.
260'	270'	Medium brown sand containing small amounts of silt.
270'	290'	Coarse sand and pebbles of plutonic rock, (quartz monzonite) and quartzite. (Silt from 285' and 287').

STEFFEN ROBERTSON & KIRSTEN
Consulting Engineers

CLIENT	Data Supplied by Previous Owner
PROJECT	Tintic
PROJECT No.	13701
DATE DRILLED	1/19/81-1/22/81
DRILLER	
WELL No.	NLE-1
SHEET	2 OF 2
INSPECTOR	

2-C

LOCATION SE 1/4, Sec. 26, T. 10S, R.3W

COORDINATES **SURFACE ELEVATION**

COMMENTS Air to 255', water to 595', Water table at 440', air lift water 4 gpm at 500', 8 gpm at 520', 11 gpm at 540', 9 gpm at 555', 15 gpm at 575', 9 and 14 gpm at 595'. Ec = 1250 mmhos/cm

FROM	TO	DESCRIPTION
290'	380'	Coarse sand and pebbles including plutonic rock, quartzite and dark grey limestone. (Medium brown fine sand and silt from 369' to 371').
380'	390'	Coarse sand and gravel composed of plutonic rock and quartzite. Limestone nearly absent. (Bed of silt and fine sand 385' to 387').
390'	400'	Coarse sand and gravel composed of plutonic rock and quartzite. No limestone. (Clay and silt 396' to 398').
400'	410'	Medium brown silt, clay, sand and gravel.
410'	440'	Coarse sand and gravel of plutonic rock including quartzite. No limestone. (Brown silt from 421' to 425'). (Water table at 440').
440'	500'	Predominantly coarse sand and granules of plutonic rock including quartzite, some silt and pebbles. No limestone.
500'	560'	Coarse sand and granules of plutonic rock. No pebbles but some silt.
560'	580'	Coarse sand, clay and silt with a few pebbles of plutonic rock.
580'	595'	Coarse sand granules of plutonic rock. No silt or clay.

STEFFEN ROBERTSON & KIRSTEN
Consulting Engineers

CLIENT Data supplied by previous owner
PROJECT Tintic
PROJECT No. 1370
DATE DRILLED 1/22/81-1/25/81
DRILLER

WELL No. NLE-2 2-D MW-
SHEET 1 OF 2
INSPECTOR

LOCATION Sec. 35, T 10S, R.3W
COORDINATES
SURFACE ELEVATION
COMMENTS Air to 70', water to 528', water table at 330'. Air lift water 3 gpm at 360', 9.7 gpm at 380', 9 gpm at 400', 15 gpm at 415', 13.6 gpm at 435' 18.8 gpm at 455', 27.3 gpm at 475', 35 gpm at 495, 50 gpm at 515'.

FROM	TO	DESCRIPTION
0'	10'	Medium tan sand to pebbles (quartzite and grey limestone) containing silt.
10'	20'	Medium tan silt, clay and fine sand containing coarse sand and a few pebbles of grey limestone.
20'	30'	Medium tan, silt to fine sand; a few pebbles of grey limestone.
30'	40'	Medium tan silt to fine sand with a small amount of mediume sand.
40'	50'	Medium tan silty with some fine sand and a few pebbles of grey limestone.
50'	60'	Medium tan silt and very fine sand with substantial amounts of pebbles (limestone and quartzite).
60'	70'	Medium tan silt and clay with small amounts of medium size sand.
70'	80'	Medium tan sand to pebbles (limestone and quartzite) contains substantial clay.
80'	100'	Light tan coarse sand and pebbles (limestone and quartzite) with minor amounts of silt.
100'	110'	Medium tan silt containing sand to pebbles of limestone and quartzite.
110'	140'	Light tan coarse sand and pebbles (limestone and quartzite) with minor amounts of silt.
140'	150'	Medium tan silt containing sand to cobbles of limestone and quartzite.
150'	190'	Light tan coarse sand and pebbles (limestone and quartzite) with minor amounts of silt.
190'	200'	Medium tan silt containing sand to cobbles of limestone and quartzite.
200'	230'	Light tan coarse sand and pebbles (limestone and quartzite) with minor amounts of silt.
230'	240'	Medium tan silt to coarse sand and pebbles of limestone and quartzite.
240'	290'	Medium tan coarse sand and pebbles of limestone and quartzite with minor amounts of silt.
290'	300'	Medium tan silt with sand to pebbles of limestone and quartzite.
300'	310'	Medium tan sand to ½ebbles (limestone and quartzite) containing a minor amount of silt.

2-I

STEFFEN ROBERTSON & KIRSTEN
Consulting Engineers

CLIENT Data supplied by previous owner
PROJECT Tintic
PROJECT No. 13701
DATE DRILLED 1/22/81-1/25/81
DRILLER

WELL No. NLE-2
SHEET 1 OF 2
INSPECTOR

LOCATION Sec. 35, T 10S, R.3W

COORDINATES

SURFACE ELEVATION

COMMENTS Air to 70', water to 528', water table at 330'. Air lift water 3 gpm at 360', 9.7 gpm at 380', 9 gpm at 400', 15 gpm at 415', 13.6 gpm at 435', 18.8 gpm at 455', 27.3 gpm at 475', 35 gpm at 495, 50 gpm at 515'.

FROM	TO	DESCRIPTION
290'	300'	Medium tan sand to pebbles of limestone and quartzite - no silt.
300'	310'	Medium tan clay and silt containing sand to pebbles of limestone and quartzite.
310'	320'	Medium tan silt containing sand to pebbles of limestone and quartzite with a few pebbles of limestone.
320'	330'	Medium tan silt and clay with sand and pebbles of limestone and quartzite.
330'	390'	Medium tan sand to pebbles (plutonic rock, limestone and quartzite) with minor amounts of silt and fine sand.
390'	400'	Medium tan clay containing sand to pebbles of limestone and quartzite.
400'	410'	Medium tan clay with some coarse sand.
410'	420'	Medium tan clay with coarse sand and pebbles.
420'	430'	Medium tan clay with medium to coarse sand.
430'	440'	Medium tan sand to granules with minor amounts of silt.
440'	450'	Medium tan sand to pebbles of plutonic rocks, limestone and quartzite with minor amounts of silt.
450'	460'	Medium sand to granules with minor amounts of pebbles and silt.
460'	528'	Dark brown medium to coarse sand. No silt, small amounts of fine sand.
TD	528'	Medium tan heavy clay.

APPENDIX C
Tables

Inputs and Results of Mass Balance/Mixing Modeling

(The LNEWS and SIWS Data contain leach field effluent.)

	Assumed Concentration in Recharge Water (from Table 3)	Average Concentration in Leach Pad Effluent (from Appendix C)	Units	Units	Eureka (Rainfall 0.92')			Little Sahara (Rainfall 0.53')			Average (Rainfall 0.73')		
					LNEWS	MGWS	SIWS	LNEWS	MGWS	SIWS	LNEWS	MGWS	SIWS
				Liters	**2.54E+11**	**1.91E+09**	**3.11E+08**	**1.46E+11**	**1.11E+09**	**1.88E+08**	**2.00E+11**	**1.52E+09**	**2.49E+08**
					Mass of each Parameter								
Alkalinity, as Bicarbonate	**137.25**	**277.75**	mg/L	mg	3.49E+13	2.67E+11	4.82E+10	2.01E+13	1.57E+11	3.13E+10	2.75E+13	2.14E+11	3.98E+10
Alkalinity, as Carbonate	**0.75**	**0**	mg/L	mg	1.91E+11	1.43E+09	2.33E+08	1.10E+11	8.30E+08	1.41E+08	1.50E+11	1.14E+09	1.87E+08
Aluminum	**0.008**	**0.000**	mg/L	mg	2.03E+09	1.53E+07	2.49E+06	1.17E+09	8.85E+06	1.50E+06	1.60E+09	1.21E+07	2.00E+06
Arsenic	**0.005**	**19.36**	mg/L	mg	1.66E+09	3.95E+08	3.87E+08	1.12E+09	3.91E+08	3.86E+08	1.39E+09	3.93E+08	3.86E+08
Barium	**0.065**	**0.056**	mg/L	mg	1.65E+10	1.25E+08	2.13E+07	9.52E+09	7.31E+07	1.33E+07	1.30E+10	9.97E+07	1.73E+07
Cadmium	**0.002**	**0.0269**	mg/L	mg	5.09E+08	4.35E+06	1.16E+06	2.93E+08	2.75E+06	9.11E+05	4.01E+08	3.57E+06	1.03E+06
Calcium	**55.8**	**474.0**	mg/L	mg	1.42E+13	1.16E+11	2.68E+10	8.18E+12	7.12E+10	1.99E+10	1.12E+13	9.41E+10	2.34E+10
Carbon Dioxide	**0.3**	**0.0**	mg/L	mg	7.63E+10	5.72E+08	9.34E+07	4.39E+10	3.32E+08	5.63E+07	6.01E+10	4.55E+08	7.48E+07
Chloride	**133**	**2220**	mg/L	mg	3.39E+13	2.98E+11	8.56E+10	1.95E+13	1.91E+11	6.91E+10	2.67E+13	2.46E+11	7.73E+10
Chromium	**0.005**	**0.027**	mg/L	mg	1.27E+09	1.01E+07	2.09E+06	7.33E+08	6.07E+06	1.48E+06	1.00E+09	8.12E+06	1.78E+06
Copper	**0.01**	**26.31**	mg/L	mg	3.07E+09	5.43E+08	5.27E+08	1.99E+09	5.35E+08	5.25E+08	2.53E+09	5.39E+08	5.26E+08
Cyanide Total	**0.004**	**32.22**	mg/L	mg	1.66E+09	6.49E+08	6.42E+08	1.23E+09	6.45E+08	6.42E+08	1.44E+09	6.47E+08	6.42E+08
Cyanide WAD	**0**	**19.6**	mg/L	mg	3.90E+08	3.90E+08	3.90E+08	3.90E+08	3.90E+08	3.90E+08	3.90E+08	3.90E+08	3.90E+08
Fluoride	**0.2**	**3.0**	mg/L	mg	5.09E+10	4.41E+08	1.22E+08	2.94E+10	2.81E+08	9.76E+07	4.01E+10	3.63E+08	1.10E+08
Hydroxide	**0.25**	**0.00**	mg/L	mg	6.36E+10	4.77E+08	7.78E+07	3.66E+10	2.77E+08	4.69E+07	5.01E+10	3.79E+08	6.24E+07
Iron	**0.17**	**0.00**	mg/L	mg	4.32E+10	3.24E+08	5.29E+07	2.49E+10	1.88E+08	3.19E+07	3.41E+10	2.58E+08	4.24E+07
Lead	**0.013**	**0.158**	mg/L	mg	3.31E+09	2.79E+07	7.19E+06	1.91E+09	1.75E+07	5.58E+06	2.61E+09	2.29E+07	6.39E+06
Magnesium	**30.8**	**14.26**	mg/L	mg	7.83E+12	5.90E+10	9.87E+09	4.51E+12	3.44E+10	6.07E+09	6.17E+12	4.70E+10	7.97E+09
Manganese	**0.009**	**0.107**	mg/L	mg	2.29E+09	1.93E+07	4.93E+06	1.32E+09	1.21E+07	3.82E+06	1.81E+09	1.58E+07	4.37E+06
Mercury	**0.0002**	**0.0998**	mg/L	mg	5.28E+07	2.37E+06	2.05E+06	3.13E+07	2.21E+06	2.02E+06	4.21E+07	2.29E+06	2.04E+06
Nitrite, Nitrogen	**0.004**	**13.775**	mg/L	mg	1.29E+09	2.82E+08	2.75E+08	8.60E+08	2.78E+08	2.75E+08	1.08E+09	2.80E+08	2.75E+08
Nitrate+Nitrite-Total	**1.01**	**595.93**	mg/L	mg	2.69E+11	1.38E+10	1.22E+10	1.60E+11	1.30E+10	1.20E+10	2.14E+11	1.34E+10	1.21E+10
Potassium	**3.37**	**316.00**	mg/L	mg	8.63E+11	1.27E+10	7.34E+09	5.00E+11	1.00E+10	6.92E+09	6.81E+11	1.14E+10	7.13E+09
Selenium	**0.0029**	**0.1337**	mg/L	mg	7.40E+08	8.19E+06	3.56E+06	4.27E+08	5.87E+06	3.20E+06	5.84E+08	7.06E+06	3.38E+06
Silver	**0.0144**	**0.2034**	mg/L	mg	3.66E+09	3.15E+07	8.53E+06	2.11E+09	2.00E+07	6.75E+06	2.89E+09	2.59E+07	7.64E+06
Sodium	**57.7**	**5845.0**	mg/L	mg	1.48E+13	2.26E+11	1.34E+11	8.57E+12	1.80E+11	1.27E+11	1.17E+13	2.04E+11	1.31E+11
Sulfate	**83.9**	**8888.0**	mg/L	mg	2.15E+13	3.37E+11	2.03E+11	1.25E+13	2.70E+11	1.93E+11	1.70E+13	3.04E+11	1.98E+11
Total Desolved Solids	**498**	**19242**	mg/L	mg	1.27E+14	1.33E+12	5.38E+11	7.33E+13	9.34E+11	4.76E+11	1.00E+14	1.14E+12	5.07E+11
Zinc	**0.059**	**22.905**	mg/L	mg	1.55E+10	5.68E+08	4.74E+08	9.10E+09	5.21E+08	4.67E+08	4.60E+12	5.45E+08	4.70E+08

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Inputs and Results of Mass Balance/Mixing Modeling

(The LNEWS and SIWS Data do not contain leach field effluent.)

	Assumed Concentration in Recharge Water (from Table 3)	Average Concentration in Leach Pad Effluent (from Appendix C)	Units	Units	Eureka (Rainfall 0.92')			Little Sahara (Rainfall 0.53')			Average (Rainfall 0.73')		
					LNEWS	MGWS	SIWS	LNEWS	MGWS	SIWS	LNEWS	MGWS	SIWS
				Liters	2.54E+11	1.89E+09	2.91E+08	1.46E+11	1.09E+09	1.68E+08	2.00E+11	1.50E+09	2.30E+08
					Mass of each Parameter								
Alkalinity, as Bicarbonate	137.25	277.75	mg/L	mg	3.49E+13	2.59E+11	4.00E+10	2.01E+13	1.49E+11	2.30E+10	2.75E+13	2.05E+11	3.15E+10
Alkalinity, as Carbonate	0.75	0	mg/L	mg	1.91E+11	1.42E+09	2.18E+08	1.10E+11	8.15E+08	1.26E+08	1.50E+11	1.12E+09	1.72E+08
Aluminum	0.008	0.000	mg/L	mg	2.03E+09	1.51E+07	2.33E+06	1.17E+09	8.70E+06	1.34E+06	1.60E+09	1.20E+07	1.84E+06
Arsenic	0.005	19.36	mg/L	mg	1.27E+09	9.43E+06	1.46E+06	7.32E+08	5.43E+06	8.39E+05	1.00E+09	7.49E+06	1.15E+06
Barium	0.065	0.056	mg/L	mg	1.65E+10	1.23E+08	1.89E+07	9.52E+09	7.06E+07	1.09E+07	1.30E+10	9.73E+07	1.49E+07
Cadmium	0.002	0.0269	mg/L	mg	5.08E+08	3.77E+06	5.83E+05	2.93E+08	2.17E+06	3.36E+05	4.01E+08	2.99E+06	4.59E+05
Calcium	55.8	474.0	mg/L	mg	1.42E+13	1.05E+11	1.63E+10	8.17E+12	6.06E+10	9.36E+09	1.12E+13	8.35E+10	1.28E+10
Carbon Dioxide	0.3	0.0	mg/L	mg	7.63E+10	5.66E+08	8.74E+07	4.39E+10	3.26E+08	5.03E+07	6.01E+10	4.49E+08	6.89E+07
Chloride	133	2220	mg/L	mg	3.38E+13	2.51E+11	3.87E+10	1.95E+13	1.45E+11	2.23E+10	2.66E+13	1.99E+11	3.05E+10
Chromium	0.005	0.027	mg/L	mg	1.27E+09	9.43E+06	1.46E+06	7.32E+08	5.43E+06	8.39E+05	1.00E+09	7.49E+06	1.15E+06
Copper	0.01	26.31	mg/L	mg	2.54E+09	1.89E+07	2.91E+06	1.46E+09	1.09E+07	1.68E+06	2.00E+09	1.50E+07	2.30E+06
Cyanide Total	0.004	32.22	mg/L	mg	1.02E+09	7.55E+06	1.17E+06	5.86E+08	4.35E+06	6.71E+05	8.01E+08	5.99E+06	9.18E+05
Cyanide WAD	0	19.6	mg/L	mg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoride	0.2	3.0	mg/L	mg	5.08E+10	3.77E+08	5.83E+07	2.93E+10	2.17E+08	3.36E+07	4.01E+10	2.99E+08	4.59E+07
Hydroxide	0.25	0.00	mg/L	mg	6.35E+10	4.72E+08	7.28E+07	3.66E+10	2.72E+08	4.20E+07	5.01E+10	3.74E+08	5.74E+07
Iron	0.17	0.00	mg/L	mg	4.32E+10	3.21E+08	4.95E+07	2.49E+10	1.85E+08	2.85E+07	3.41E+10	2.55E+08	3.90E+07
Lead	0.013	0.158	mg/L	mg	3.30E+09	2.45E+07	3.79E+06	1.90E+09	1.41E+07	2.18E+06	2.60E+09	1.95E+07	2.98E+06
Magnesium	30.8	14.26	mg/L	mg	7.83E+12	5.81E+10	8.97E+09	4.51E+12	3.35E+10	5.17E+09	6.17E+12	4.61E+10	7.07E+09
Manganese	0.009	0.107	mg/L	mg	2.29E+09	1.70E+07	2.62E+06	1.32E+09	9.78E+06	1.51E+06	1.80E+09	1.35E+07	2.07E+06
Mercury	0.0002	0.0998	mg/L	mg	5.08E+07	3.77E+05	5.83E+04	2.93E+07	2.17E+05	3.36E+04	4.01E+07	2.99E+05	4.59E+04
Nitrite, Nitrogen	0.004	13.775	mg/L	mg	1.02E+09	7.55E+06	1.17E+06	5.86E+08	4.35E+06	6.71E+05	8.01E+08	5.99E+06	9.18E+05
Nitrate+Nitrite-Total	1.01	595.93	mg/L	mg	2.57E+11	1.91E+09	2.94E+08	1.48E+11	1.10E+09	1.70E+08	2.02E+11	1.51E+09	2.32E+08
Potassium	3.37	316.00	mg/L	mg	8.57E+11	6.36E+09	9.82E+08	4.93E+11	3.66E+09	5.66E+08	6.75E+11	5.05E+09	7.74E+08
Selenium	0.0029	0.1337	mg/L	mg	7.37E+08	5.47E+06	8.45E+05	4.25E+08	3.15E+06	4.87E+05	5.81E+08	4.34E+06	6.66E+05
Silver	0.0144	0.2034	mg/L	mg	3.66E+09	2.72E+07	4.19E+06	2.11E+09	1.57E+07	2.42E+06	2.88E+09	2.16E+07	3.31E+06
Sodium	57.7	5845.0	mg/L	mg	1.47E+13	1.09E+11	1.68E+10	8.45E+12	6.27E+10	9.68E+09	1.16E+13	8.64E+10	1.32E+10
Sulfate	83.9	8888.0	mg/L	mg	2.13E+13	1.58E+11	2.44E+10	1.23E+13	9.12E+10	1.41E+10	1.68E+13	1.26E+11	1.93E+10
Total Desolved Solids	498	19242	mg/L	mg	1.27E+14	9.40E+11	1.45E+11	7.29E+13	5.41E+11	8.36E+10	9.98E+13	7.46E+11	1.14E+11
Zinc	0.059	22.905	mg/L	mg	1.50E+10	1.11E+08	1.72E+07	8.64E+09	6.41E+07	9.90E+06	1.18E+10	8.83E+07	1.35E+07

Inputs and Results of Mass Balance/Mixing Modeling

(The LNEWS and SIWS Data contain leach field effluent.)

	Assumed Concentration in Recharge Water (from Table 3)	Average Concentration in Leach Pad Effluent (from Appendix C)	Units	Units	Eureka (Rainfall 0.92')			Little Sahara (Rainfall 0.53')			Average (Rainfall 0.73')		
					LNEWS	MGWS	SIWS	LNEWS	MGWS	SIWS	LNEWS	MGWS	SIWS
				Liters	2.54E+11	1.91E+09	3.11E+08	1.46E+11	1.11E+09	1.88E+08	2.00E+11	1.52E+09	2.49E+08
					Concentrations of each Parameter								
Alkalinity, as Bicarbonate	137.25	277.75	mg/L	mg/L	137.27	139.74	155.01	137.29	141.52	166.69	137.28	140.38	159.40
Alkalinity, as Carbonate	0.75	0	mg/L	mg/L	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Aluminum	0.008	0.000	mg/L	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Arsenic	0.005	19.36	mg/L	mg/L	0.01	0.18	1.24	0.01	0.30	2.06	0.01	0.22	1.55
Barium	0.065	0.056	mg/L	mg/L	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Cadmium	0.002	0.0269	mg/L	mg/L	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Calcium	55.8	474.0	mg/L	mg/L	55.84	60.05	86.10	55.86	63.09	106.04	55.85	61.14	93.60
Carbon Dioxide	0.3	0.0	mg/L	mg/L	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Chloride	133	2220	mg/L	mg/L	133.17	152.91	274.93	133.30	167.12	368.29	133.22	158.00	310.06
Chromium	0.005	0.027	mg/L	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Copper	0.01	26.31	mg/L	mg/L	0.01	0.25	1.69	0.01	0.41	2.80	0.01	0.31	2.11
Cyanide Total	0.004	32.22	mg/L	mg/L	0.01	0.29	2.06	0.01	0.50	3.42	0.01	0.37	2.57
Cyanide WAD	0	19.6	mg/L	mg/L	0.00	0.18	1.25	0.00	0.30	2.08	0.00	0.22	1.56
Fluoride	0.2	3.0	mg/L	mg/L	0.20	0.23	0.39	0.20	0.25	0.52	0.20	0.23	0.44
Hydroxide	0.25	0.00	mg/L	mg/L	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Iron	0.17	0.00	mg/L	mg/L	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Lead	0.013	0.158	mg/L	mg/L	0.01	0.01	0.02	0.01	0.02	0.03	0.01	0.01	0.03
Magnesium	30.8	14.26	mg/L	mg/L	30.80	30.93	31.71	30.80	31.02	32.31	30.80	30.96	31.94
Manganese	0.009	0.107	mg/L	mg/L	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.02
Mercury	0.0002	0.0998	mg/L	mg/L	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.01
Nitrite, Nitrogen	0.004	13.775	mg/L	mg/L	0.01	0.13	0.88	0.01	0.22	1.46	0.01	0.16	1.10
Nitrate+Nitrite-Total	1.01	595.93	mg/L	mg/L	1.06	6.36	39.11	1.09	10.17	64.17	1.07	7.72	48.54
Potassium	3.37	316.00	mg/L	mg/L	3.39	6.20	23.57	3.41	8.23	36.86	3.40	6.93	28.57
Selenium	0.0029	0.1337	mg/L	mg/L	0.00	0.00	0.01	0.00	0.00	0.02	0.00	0.00	0.01
Silver	0.0144	0.2034	mg/L	mg/L	0.01	0.02	0.03	0.01	0.02	0.04	0.01	0.02	0.03
Sodium	57.7	5845.0	mg/L	mg/L	58.16	110.13	431.38	58.49	147.53	677.20	58.28	123.53	523.87
Sulfate	83.9	8888.0	mg/L	mg/L	84.60	163.63	652.12	85.11	220.50	1025.93	84.78	184.00	792.76
Total Desolved Solids	498	19242	mg/L	mg/L	499.51	670.61	1728.16	500.61	793.74	2537.43	499.91	714.72	2032.64
Zinc	0.059	22.905	mg/L	mg/L	0.06	0.26	1.52	0.06	0.41	2.49	0.06	0.32	1.89

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Mine Permit Number M0230007 Mine Name North Lily - Tintic Project
Operator North Lily Mining Co. Date 12-1-2000
TO Don Ostler, Directer FROM Robert J. Bayer

__CONFIDENTIAL __BOND CLOSURE __LARGE MAPS X EXPANDABLE
__MULTIPUL DOCUMENT TRACKING SHEET __NEW APPROVED NOI
__AMENDMENT __OTHER____________________

Description YEAR-Record Number

__NOI X Incoming __Outgoing __Internal __Superceded

Post Closure Fluid Management Plan - North Silver City Facility

__NOI __Incoming __Outgoing __Internal __Superceded

__NOI __Incoming __Outgoing __Internal __Superceded

__NOI __Incoming __Outgoing __Internal __Superceded

__TEXT/ 81/2 X 11 MAP PAGES __11 X 17 MAPS __LARGE MAP

COMMENTS: ____________________

CC: ____________________